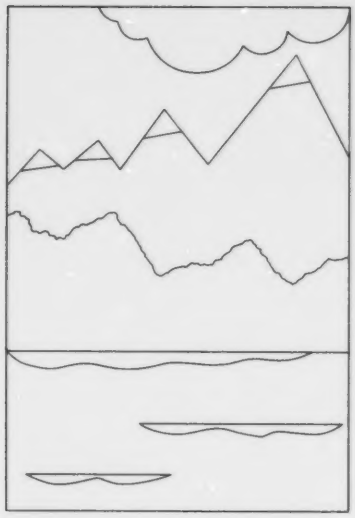

ANNUAL REPORT

1988
1989

Alberta
ENVIRONMENT

91-03753/

Alberta

ENVIRONMENT

Office of the Minister

130 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/427-2391 Fax 403/422-6259

The Honourable David J. Carter
Office of the Speaker
Legislative Assembly of Alberta

Sir:

I have the honour to present the nineteenth Annual Report of the Department of the Environment for the year ended March 31, 1989.

Respectfully submitted,

RALPH P. KLEIN
Minister

Alberta
ENVIRONMENT

Office of the Deputy Minister

14th Floor, Oxbridge Place, 9820 - 106 Street, Edmonton, Alberta, Canada T5K 2J6 403/427-6236

The Honourable Ralph P. Klein
Minister of Environment
130 Legislature Building
Edmonton, Alberta

Sir:

I have the honour to present the nineteenth Annual Report of Alberta Environment, for the fiscal year ending March 31, 1989.

The department continues to carry out its diverse responsibilities successfully through the hard work and dedication of its staff.

Respectfully submitted,

Vance A. MacNichol, P. Eng.
DEPUTY MINISTER

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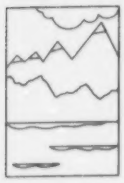

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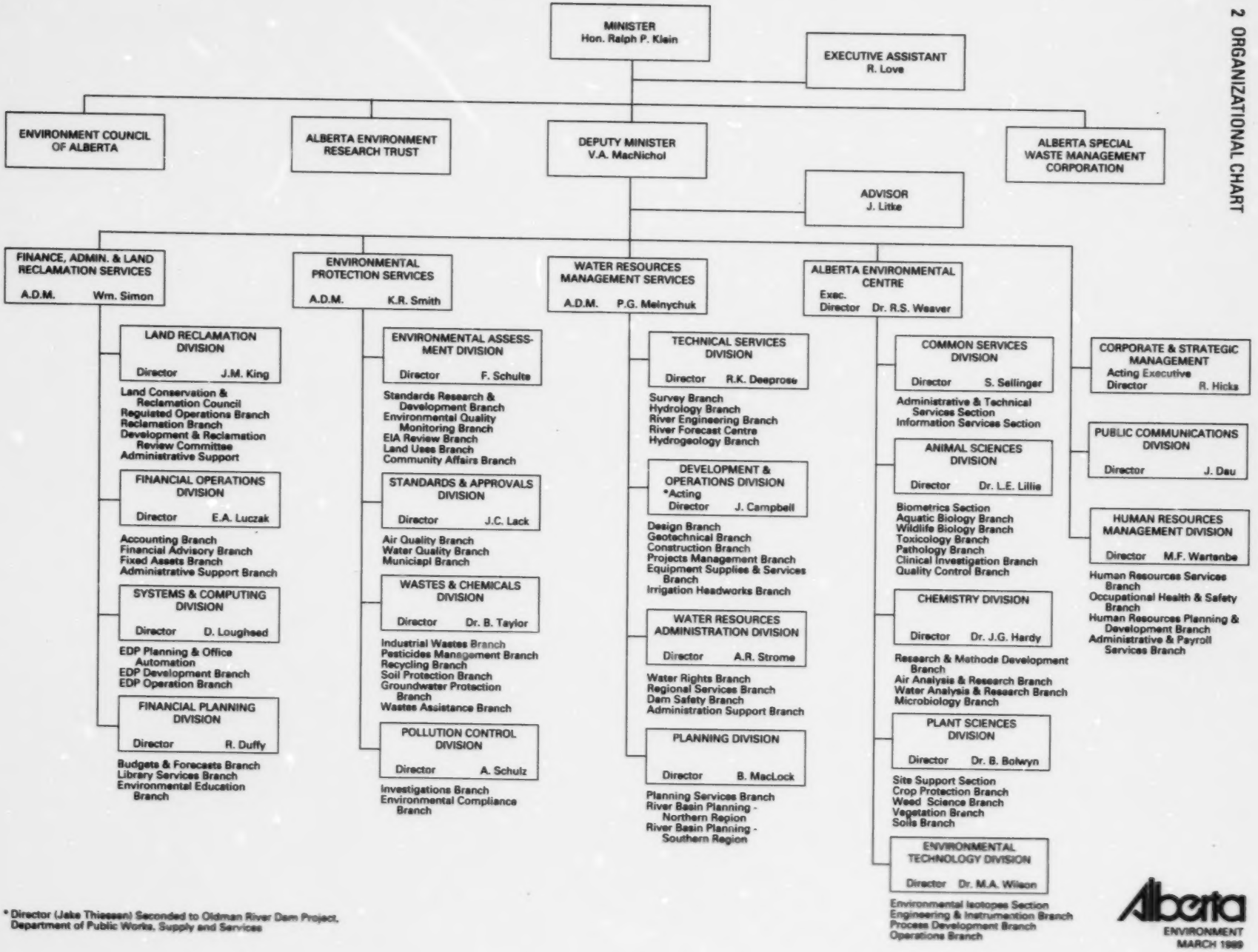
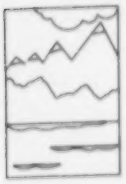


* Director (Jake Thiessen) Seconded to Oldman River Dam Project, Department of Public Works, Supply and Services

Alberta
ENVIRONMENT
MARCH 1989

OFFICE OF THE DEPUTY MINISTER

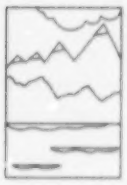


Vance A. MacNichol
Deputy Minister

Ron Hicks
Acting Executive Director
Corporate and Strategic Management

Jim Dau
Director
Public Communications Division

Morgan F. Wartenbe
Director
Human Resources Management Division



CORPORATE AND STRATEGIC MANAGEMENT DIVISION

The Corporate and Strategic Management Division was formed in April, 1988. The division has the following responsibilities: managing the corporate and strategic activities of the department; leading the development of the department's directional, strategic and tactical planning systems and activities; directing environmental scanning activities and issue response strategies, and managing external relations of the department.

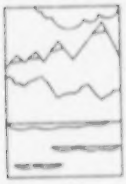
The division is headed by an Executive Director, who reports directly to the Deputy Minister and is a member of Executive Committee.

During 1988-89 Corporate and Strategic Management Division staff assisted in developing response strategies for several environmental issues which have dominated national and global environmental agendas. These issues included climate change, acid rain, ozone depletion, sustainable development and water quality protection.

Division staff led or participated in federal/provincial and interdepartmental task forces set up to develop national and provincial strategies to deal with these issues.

Division staff also co-ordinated the department's Canadian Council of Ministers of the Environment (CCME) activities.

Other activities included initiation of an environmental scanning program to identify environmental issues and the provision of secretariat support to the Deputy Minister and the Minister on specific provincial and federal/provincial committees.



PUBLIC COMMUNICATIONS DIVISION

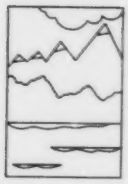
The division coordinates communications needs of the department, including the development, design and distribution of materials, as well as media relations and communications planning.

Four issues of the magazine *Environment Views* were published. They examined the themes of current trends; water literacy, tourism, the changing atmosphere and the environment is everyone's business. Total circulation of this free subscription magazine is approximately 15,000.

A number of activities were organized throughout the province to mark Environment Week, including the second annual Alberta Environment Awards, displays at shopping malls, open houses, the great Alberta drinking water challenge and a special Environment Week publication, "Blue Sky Alberta", distributed to all Alberta homes.

Environmental issues again attracted a great deal of media attention and more than 270 news releases were issued. The division also responded to more than 3,600 media calls.

The communications director, two public affairs officers, two contracted consultants and a production coordinator in the Edmonton office handled more than 342 orders for print materials, photography, advertising, displays, signage and audio-visual presentations.



HUMAN RESOURCES MANAGEMENT DIVISION

The Human Resources Management Division is directly responsible to the Deputy Minister for providing services to enable the department to effectively serve the public with a competent, safety conscious work force.

Four branches report to the director, Administrative and Payroll Services, Human Resource Services, Human Resources Planning & Development, and Occupational Health and Safety.

Administrative and Payroll Services Branch

This branch provides a number of administrative services to the department including parking, commissioner for oaths and identification cards. It is responsible for the comprehensive payroll function in the department and administers the full array of benefits to employees. As of March 31, 1989, the department had 1,065 salaried positions (Table 19), with more than half located in Edmonton and the remainder strategically placed to provide service throughout the province (Table 20, 21).

During 1988-89, 69 salaried and 470 wage employees joined the department, 62 salaried and 510 wage employees terminated their employment and 23 employees were transferred to other provincial government departments.

Human Resource Services Branch

This branch provides comprehensive human resource services through a staff of four consultants and the division director.

Organizational changes and regular updating of position descriptions resulted in the classification of 194 positions. The staff has delegated authority to make classification decisions on all positions except those in management. The branch conducted 140 recruitment transactions.

The staff of this branch assists employees and management on employee relations issues, career planning, organization development matters, grievances and complaint procedures. They also help administer the long term disability income program and assist with design and delivery of in-house training.

Branch staff also participated in a number of special projects including the following: a proposed new research scientist classification series which is being designed to help attract and retain an increased number of world-calibre scientists at the Alberta Environmental Centre in Vegreville; development and implementation of an administrative support series; a review to accommodate classification changes with Journeyman Trades Certificate requirements for Crane and Hoisting Equipment Operators; and design and testing of a government-wide computerized system for staffing transactions.

Human Resources Planning and Development Branch

This year participation in external courses increased and while no education leave was granted, there was a greater involvement in credit courses.

Internally, more employees completed the Working Together as a Team program than any other. Some line instructors were lost to other employers and six new line instructors were trained and certified. This program is coordinated by one of the human resource consultants with courses being offered in Edmonton, Vegreville, and Lethbridge.

Two Supervision programs were offered during the year and the Frontline Leadership program was introduced. A Frontline Leadership program has been scheduled for Vegreville.

Other internal programs include pension information seminars for both management and non-management plans, telephone courtesy and stress management.

The department has one manager in Phase III of the Western Career Assignment Program and this has proven to be very successful. As a result, another manager has completed Phase I and is expected to complete Phase II (the 10 week formal education program) in the summer of 1990.

A committee which has demanded considerable time is the department Water Resources Management Services Committee which is updating the roles and responsibilities for that service.

The branch head has also been asked to assist the Personnel Administration Office with "When Vision Meets Reality", a follow-up event to The Insightful Manager program and is the department representative on the government human rights committee.

Administration of the staff development and appraisal functions demanded the most time, but it is expected that initiatives in the Women's Program will increase in 1990-91.

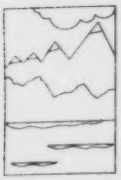
Occupational Health and Safety Branch

This branch coordinates the department's occupational health, safety and hygiene programs, provides a professional consultation service to staff and is the main contact with the Worker's Compensation Board, Community and Occupational Health and Safety Department and the Occupational Health and Safety Branch of the Personnel Administration Office.

Emphasis remained on safety training and awareness programs, with special attention being given to orienting the department to the Workplace Hazardous Materials Information System regulations (WHMIS). During the year, 106 in-house health and safety training programs were arranged with more than 1300 participants involved.

Work undertaken in the area of health and safety included work site visits, a biennial industrial hygiene survey of potentially hazardous worksites, drafting of a Principal Contractor Policy, and implementation of WHMIS. In order to assist the department in meeting the new WHMIS regulations a department inventory of hazardous materials was collected, material safety data sheets were compiled, a policy developed, and a WHMIS manual, course material and information brochures were developed.

ALBERTA ENVIRONMENTAL CENTRE



Dr. R. Sherman Weaver
Executive Director

Stan Selinger
Director
Common Services Division

Dr. L.E. Lillie
Director
Animal Sciences Division

Dr. John Hardy
Director
Chemistry Division

Dr. B. Bolwyn
Director
Plant Sciences Division

Dr. Malcolm Wilson
Director
Environmental Technology Division

The Alberta Environmental Centre in Vegreville is the province's major facility for applied environmental research, technology development and related services. These activities were carried out at the request of provincial agencies and the public after review and approval by the centre's Board of Directors and Technical Advisory Committee.

The Departments of Environment; Agriculture; Forestry, Lands and Wildlife; Community and Occupational Health; and the Alberta Research Council are the centre's main clients. Alberta Technology, Research and Telecommunications continued efforts to find commercial applications for new technologies developed at the centre. Inventions or processes which are potentially exploitable are being investigated.

While most of the research was conducted at the centre's 19,000 square metre main laboratory building in Vegreville, staff also travelled throughout the province to pursue problems presented by client agencies. Studies ranged from using insects to control weeds to analysis of environmental pollutants to drinking water treatment, and involved specialists from fields as diverse as veterinary medicine, agrology, chemistry, microbiology, engineering and library science. Emphasis continued on attempts to develop a true interdisciplinary approach to individual environmental problems.

Demand for the analytical and diagnostic services available through the centre again was heavy. More than 23,000 samples of water, air, soil and other materials were subjected to about 273,000 tests to support provincial programs in health, pollution abatement and control, and fish and wildlife management.

About 2,300 specimens of weeds, insects, plant diseases and chemically damaged plants were examined at the request of farmers, gardeners and agricultural personnel. The centre also handled identification of bacteria for non-medical purposes and provided a rapid toxicity testing service using bacteria.

Providing information to client agencies and the public continued to be a significant part of the centre's work. Staff responded to many inquiries for pest control and chemical damage information, prepared and manned public displays and participated in numerous other activities including Environment Week in Vegreville.

The applied research carried out by the centre can be broken down into six broad categories; pest management, water/wastewater management, environmental toxicology, living natural resources, waste management, and land resources.

Analytical, Diagnostic, Extension and Technical Services

The centre provides information on the quality of air and water, and on the results of studies on environmental pollutants, wastewater, weed science and crop protection, to the people of Alberta and other government departments and agencies.

The centre is the main chemical analysis laboratory providing support to Alberta Environment's licensing, investigation, monitoring and enforcement programs. As part of a major air analysis services program, approximately 6,600 air samples were run through more than 17,000 tests. Centre staff also worked to develop new and more effective tests for atmospheric pollutants. Two hundred precipitation samples were analysed for 2,000 parameters under the Precipitation Studies program. Under the federal government program on Long Range Transport of Air Pollutants (LRTAP), 30 precipitation quality control check samples were analyzed: very good comparability of results was achieved in those studies.

The department was supplied with information used in monitoring municipal water supplies, waste treatment facilities, industrial waste discharges and surface water quality investigations. The centre's facilities were used frequently by public health units throughout the province to test the quality of drinking water from wells and other private water supplies. About 11,300 water samples were received and analysed which constituted some 183,000 tests in support of these programs. A total of 1,212 samples were tested for PCBs (polychlorinated biphenyls), hydrocarbons and other significant pollutants, which constituted 41,072 tests. All analytical results and legal sample analysis reports were provided to the Fish and Wildlife and Pollution Control Divisions.

The Water Analysis Laboratory continued investigations into improved sulphide analytical methods for environmental and toxicological samples. An improved automated method for screening sulphides in water was published. As well, a procedure for preservation and analysis of sulphide in blood was developed in collaboration with the Clinical Investigation Branch, Animal Sciences Division.

Pest Management specialists provided diagnostic services to farmers on problems of insects, plant diseases and weeds, and suspected chemical damage to plants. In 1988-89, 454 insects, 711 plant diseases and 312 weed specimens were diagnosed. Approximately 825 specimens were processed in the investigation of suspected chemical damage to crops and other vegetation.

Some 750 samples were analysed for a total of 10,700 parameters in providing microbiological enumeration, identification and toxicity testing services to various internal and external clients.

As part of methods development, Giardia propagation and enumeration technology was transferred to the centre from the Kananaskis Centre for Environmental Research (University of Calgary).

The Environmental Isotopes Program continued to provide tritium and C13 (radio-carbon) analyses to seven government agencies. These analyses are now provided world-wide on a fee-for-service basis. The data has been used in studies on ground water movement, wastewater management, geology and archaeology.

Electron microscope studies supported research into inhalation toxicology, plant diseases, waste management and many other fields. A total of 1,070 electron microscope investigations were conducted.

To ensure the accuracy of analyses performed at the centre, high priority was given to quality assurance and quality control. For example, the Water Analysis Laboratory completes approximately 32,000 quality control tests per year to assure the quality of data produced in that laboratory. The Research Services and Methods Development Branch tested for 5,760 parameters to ensure the quality of trace organic analysis results.

Other services provided by the centre included assistance in the investigation of chemical spill accidents, assistance in the capture of big game animals, and developing methods for the detection and analysis of a variety of environmentally significant chemicals.

Pest Management Research and Development

Research into reducing pest damage through the use of integrated, environmentally acceptable control methods is emphasized in this program. Chemical, biological and cultural methods for controlling weeds, plant diseases and insect pests were studied, and pesticide residues in farmland soils were determined.

Research continued on the economic impact of crop losses due to weeds and on the economics of chemical weed control. Mathematical models to estimate economic thresholds for volunteer wheat and quackgrass control in canola were

developed. In addition, information was developed on crop losses due to toadflax, wild buckwheat and green foxtail. The weed survey of agricultural land of Alberta continued with Regions 1 (south) and 5 (north central) being surveyed.

Studies were conducted under field and greenhouse conditions to evaluate the performance of experimental and registered herbicides for weed control. The tolerances of new varieties of wheat and barley to commonly used herbicides were also studied. Other projects included studies on the effect of drought on herbicide performance on wild oats and quackgrass, effects of carry-over of herbicides on rotational crops, and the use of activated charcoal for inactivation of soil sterilants such as Hyvar* and Spike* in soil.

In the Biological Control of Weeds Program, a report identifying the most suitable target weeds in Alberta was completed. Research continued with a defoliating moth, a root-boring moth and a flower-feeding beetle to evaluate their potential as biocontrol agents against toadflax. Studies were completed on a flower-feeding weevil on Canada thistle, and approval was requested from Agriculture Canada to release the weevil in Alberta. Field studies were also started on the impact of a stem-mining weevil on Canada thistle. Flea beetles established on leafy spurge at Cardston proved to be successful in reducing the weed's growth and development. In cooperation with Alberta Agriculture this insect was redistributed to 17 new sites throughout Alberta. A Farming for the Future project was initiated to survey and screen plant pathogens (disease-causing bacteria and fungi) as potential biocontrol agents for weeds.

Developing integrated controls (combinations of biological, cultural and, chemical methods) for several diseases in field crops (canola, cereals, and special crops such as peas and lentils) was the main objective of a research program on plant diseases. Blackleg was the major disease researched in canola. For the first time, the disease caused economic crop losses in Alberta. Field surveys showed that about 90 percent of the fields in northeastern Alberta were infested, and the disease was spreading toward irrigated regions in southern Alberta. Several chemicals were found effective under greenhouse conditions. These chemicals will help to produce disease-free canola seed and prevent total crop losses due to blackleg. Research on identifying different races of the blackleg fungus continued. This information will be helpful to plant breeders to develop resistance to blackleg in new canola cultivars.

Investigations continued into the causes and control of alfalfa decline and other destructive diseases of alfalfa. An experiment was completed on the screening of alfalfa cultivars for resistance to Fusarium wilt and research continued on the influence of cutting practices on development of snow mold in alfalfa. A beneficial root-infecting fungal complex called mycorrhizae is an important component of intensively managed alfalfa and studies were completed on the influence of mycorrhizae on fungal wilts of alfalfa and the effect of herbicides on mycorrhizal development.

Research on insect pest management was conducted to develop information on the protection of horticultural and field crops and of livestock. A final report on methods for protection of cattle from black fly attack was completed. Data from the report supported the successful registration of the products being tested (Ectiban*, Sanbar*). Several insecticides were evaluated to determine their effectiveness against nymphs and adults of sweet potato whitefly. A grant of $50,000 was received from Farming for the Future to study integrated control procedures for western flower thrips on greenhouse cucumbers. On behalf of Alberta Agriculture, a Regional Crops Variety Trial was conducted in northeastern Alberta involving a productivity assessment of new varieties of cereals and canola at four sites, one of them at the Alberta Environmental Centre. Field monitoring of various cutworm moths was conducted to alert crop producers of potential outbreaks.

Staff also analysed pesticide residues in water, soil, vegetation and sediments as a service to clients including Alberta Environment and public health units throughout the province, as well as in support of centre activities. A total of 900 samples were tested for pesticides, which constituted some 20,500 tests. The quality assurance component of these tests required additional testing for 2,872 parameters.

Water/Wastewater Management Research and Development

A major study was initiated on the acute and chronic toxicity to fish and crustaceans of municipal untreated and treated sewage. The study aims to determine the reduction in toxicity as wastewater passes through a treatment facility. This information is intended to identify the safest means of treating municipal wastewater in Alberta.

Invertebrate assay systems were developed to determine the effects of toxic agents on two crustacean species, two mollusc species, and two fish species. The biological assay systems available at the centre are among the most comprehensive in North America.

The centre's water treatment research pilot plants were used to evaluate drinking water treatment technology. Particular emphasis was placed on ways to render harmless or remove the organism which causes giardiasis ("beaver fever"), a project carried out in cooperation with the University of Calgary. A project on improving the water treatment facilities in Elk Island National Park was undertaken. Studies were begun on the effect of pulping effluents on drinking water treatment processes.

* Indicates registered trademark

Work also continued on a long-term project to determine the distribution and concentration of environmentally significant chemicals (such as mercury) in Alberta waters. More than 700 fish tissues from 31 lakes and rivers were analysed, to monitor mercury residues in fish. In addition, a report on an earlier study on mercury residues in fish from 24 Alberta lakes and rivers was completed, and a manuscript on the geochemistry of mercury is being prepared.

Determining the effects of wastewaters on natural water systems and the life they support was the object of a number of aquatic toxicology studies. Reports produced as a result of these studies included those on the chemistry and toxicity of alum sludge, coal mine waste water, and Kraft pulp and paper mill effluent. A number of new laboratory techniques were developed to study changes in fish exposed to industrial, agricultural and municipal effluents.

Environmental Toxicology

Inhalation Toxicology is the study of the effects of inhaled gases, vapours, particulates and aerosols in animals and, by extrapolation, humans. This long-term research program was developed in response to wide-spread concern about the possible health effects of sour natural gas. Hydrogen sulphide (H_2S), the major contaminant of sour gas, has been the focus of a series of 22 studies to date in the 360m^2 inhalation toxicology contain ment facility. Studies on the development of acute pulmonary oedema (flooding of the lung) and changes in lung function and performance were undertaken in cooperation with the Universities of Alberta and Calgary. The effects of exposure for five weeks to occupational and environmental concentrations of H_2S were investigated. Reports of completed work were published in scientific journals and at scientific meetings.

At the request of Alberta Agriculture, a major new research program began on the effects of crude oil and drilling materials on livestock. The request arose from incidents of pasture contamination by drilling activities and initially focussed on the effects on range cattle. Acute toxic effects, methods of treatment and/or salvage, residues in meat and, in particular, chronic effects on growth and reproduction were of concern.

During the year, three studies were conducted on the effects of exposure of beef cattle to a typical, light, sweet, Alberta crude oil. The laboratory and data analysis phases of this work are continuing and a request to assess the effects of other oilfield chemicals is under review. Work was also undertaken to prepare facilities for long-term housing of cattle so that studies can be carried out over several calving cycles.

At the request of the Irrigation Secretariat of Alberta Agriculture, 5,000 grass carp, a grazing fish, were raised under quarantine for one year. During that period, the fish were assessed for the presence of bacterial, viral and parasitic diseases. Studies were also conducted on the feeding and growth of the fish at different water temperatures. All of the fish released for field trials in irrigation canals were verified to be genetically sterile thus eliminating the possibility of competition with native fish. This project is the first attempt in Canada to use grass carp as a biological control agent for aquatic weeds.

At the request of Alberta Technology, Research and Telecommunications, safety assessment studies were continued on a candidate biological herbicide being developed as an alternative to chemical herbicides against selected weeds in western Canada. Safety assessment studies are being provided to assist small western Canadian companies attempting to develop biological products of potential commercial importance.

Living Natural Resources

Analyses and research reports were completed on the seasonal patterns of forage selection by wapiti (elk) in relation to a wide variety of grasses and forbes used in reclamation of disturbed land sites. The majority of this field research was done in the foothills region near Hinton. A report was completed on the population characteristics of grizzly and black bears in west central Alberta.

Data from this study contributed to the proposed grizzly bear management plan for Alberta. Staff from the centre reviewed the new bear management plan for Alberta Forestry, Lands and Wildlife.

Work continued on methods for controlling pocket gophers in forage crops. Three formulations of toxicants placed in pocket gopher burrows were evaluated for their efficacy in controlling the rodents. Current research also includes the evaluation of barriers to prevent pocket gophers from recolonizing fields of newly established forage crops. Preliminary work has begun on the possibility of conducting research trials to evaluate means of reducing rodent damage to buried PVC pipelines carrying natural gas.

At the request of Alberta Forestry, Lands and Wildlife, centre staff implemented a research program to evaluate the efficacy of Ropel* and Thiram in reducing damage to spruce seedlings by hares. Research was conducted within a fenced compound at the Oliver Tree Nursery and on large plantation blocks near Calling Lake. The initial data showed the chemicals to be essentially ineffective in reducing hare damage under the research conditions. Work is continuing on this program.

In cooperation with the Fur Institute of Canada, intensive work continued on a program to develop and evaluate more humane

* Indicates registered trademark

trapping devices for harvesting wild furbearing animals. A rigorous, multi-stage assessment procedure was developed to assess candidate devices and to verify that such devices met criteria established by the Canadian General Standards Board.

Four devices developed at the centre meet all the mechanical requirements and have passed the full series of animal-based trials conducted in enclosures. Two of these devices have been field tested and two devices await such testing.

The field investigation phase of a fish population study on a major water control project (the Dickson Dam) and reservoir (Gleniffer Lake) was completed. The study showed that Gleniffer Lake cannot support an appreciable sport or commercial fishery. In addition, there was no increase in the concentration of methylmercury in fish from the reservoir. Two technical reports were published and a third is in review.

Waste Management Research and Development

Reducing environmental waste problems while exploiting the economic potential of wastes are the compatible goals of studies at the centre which use physical, chemical and biological processes to provide waste management data.

A pilot-scale incinerator was used to examine incineration as a safe method of both using and disposing of wastes.

In cooperation with Environment Canada, the U.S. Environmental Protection Agency (EPA) and private industry, centre staff continued research on solidifying and stabilizing waste. The objective of the work was to assess the suitability of selected processes for waste management in Alberta. Emphasis was placed on determining the value of commercial stabilization and fixation processes in Alberta's severe climate. Another study undertaken jointly with the EPA examined more precise methods for measuring the permeability of solidified wastes. This is important in the evaluation of disposal methods for hazardous materials.

A project on mushroom cultivation on waste cellulose continued. Good yields of edible mushrooms were obtained in experiments carried out in unused commercial greenhouse space using straw, sawdust and wood chips. Work continued on processes to decolourize Kraft mill effluents. The emphasis has changed to include AOX (adsorbable organic halides) removal as an objective.

Research continued on the use of microbiological processes in waste management. The final draft of a report of an interdisciplinary and interdepartmental research project on the impact of cattle feedlot wastes on the quality of receiving waters in Alberta was submitted for internal review.

Land Resources Management Research and Development

Land reclamation research has been a major activity at the centre since 1983. Activities related to resource exploration and development cause thousands of hectares of land to be disturbed in Alberta annually.

Research in land resource management sets standards for land reclamation, develops appropriate tests to classify the biophysical components (soil, water, vegetation, wildlife) in regard to the limitations of reclamation, and identifies the most appropriate technology (landscape design, equipment, seed, fertilizer or other amendments) to be used in land reclamation in the province.

Soil compaction, water use by crops in relation to salt movement, oil contamination of soils, and oil sand sludge dewatering were the principal problems identified for research. A new instrument for measuring soil compaction, the Centre Cone Penetrometer, was developed, tested, and distributed to land reclamation officers. Its advantages over existing tools are its low cost ($300) and its ability to measure extremely high soil strength (>60 bars).

A large field experiment designed to identify the best crop rotation to control dryland salinity was set up in 1985. The ranking of crops by water use over two years is: perennial forage (alfalfa brome), cereal grain-sweet clover rotation, continual cereal grain or canola, and summerfallow-cereal grain rotation. Linking water use to salt movement in soil will take a few more years of experimentation.

Oil contamination of soils occurs due to the massive volumes moved in pipelines in this province; accidental leakage is practically unavoidable. Reclamation is straightforward: fertilize the soil so that microorganisms can break down the petroleum. A simpler, more accurate method for measuring oil content in soil, especially wet soil, was developed and now reclamation practices can be tailored to suit the actual oil content and the kind of soil.

A breakthrough was achieved by staff at the centre in their development of a practical means of dewatering oil sand sludges by freeze-thaw and revegetation. Sludge at 30 percent solids can be dewatered to 55 percent solids in one winter by pumping sludge layers exposed to ambient freeze-thaw conditions; in the spring the surface of this sludge can then be dewatered further (to 80 percent solids) by planting reed canary grass. The combination of high solids content and an intertwined root mass creates a stable surface, ready for more sludge dewatering or final reclamation.

Research into methods of reclaiming lands disturbed by industrial activity (e.g. surface mining) was a major goal of the centre. Studies focussed on developing ways to accelerate

reclamation and on developing the plant material needed to restore land to its original capability. The aim of the Native Species for Reclamation Program is to develop, register and make available native plant material for use in the rehabilitation of disturbed lands in high-stress or sensitive environments where standard agronomic varieties are not suitable. Some 25 lines of plant material are being evaluated for their reclamation potential in three disturbed eastern slope environments (gravel pit, abandoned coal mine and ski slope). Since the required seed will need to be produced by Alberta seed growers the agronomic characteristics and seed yields of these lines are also being investigated on prairie test sites.

Technical Support

A total of 50 regulatory and supporting quality assurance bioassays of industrial wastewater were conducted in support of the Alberta Clean Water Act. Staff also responded to 31 requests for technical assistance in support of potential litigation under the Act. These requests included laboratory support, participation in field investigations and acting as expert witness.

Technical and administrative support essential for the operation of diverse applied animal-based research programs continued to be provided. The Animal Resources Program and the operation of the centre's Animal Care and Use Committee ensured that all work complied with the guidelines of the Canadian Council on Animal Care.

Essential services in clinical, anatomical and ultrastructural pathology, biochemistry and analytical toxicology were provided by the Pathology and Clinical Investigation Branches. Professional statistical and administrative support services were provided to all programs.

This program area encompassed the broad range of technical services required to support the centre's scientific and technological development activities. This included the management and development of the centre's 300-hectare Vegreville site. Crop research plots were developed and maintained, plot equipment was designed and maintained, and the site was upgraded through activities such as fencing of elk pastures and seeding of hay fields. A large fleet of equipment and vehicles was maintained, including specialized experimental plot machinery.

The centre's Waste Management Program continued. It included operation of an interim wastewater treatment plant, and systems for managing pesticides and concentrated laboratory wastes. More than 9,000 tonnes of laboratory wastewater and four tonnes of concentrated chemical wastes were treated and disposed of during the year. As well, three specialized water treatment systems were operated - a recycling plant supplying water to fish tanks, a reverse osmosis unit and an ion exchange unit which provided water for laboratory use.

Major efforts were directed towards development of centralized computing facilities to collect and process data generated by centre laboratories. Special emphasis was placed on the customization and enhancement of software for the mainframe computer.

An Instrumentation and Controls Program involved repair and maintenance of instruments as well as design and development of equipment and systems for monitoring and data collection purposes. Some 36 controlled environment growth chambers and four seed germinators were operated at capacity, providing year-round growing conditions for plant-related studies.

Administrative Support

Administrative support was provided to centre programs through the Common Services Division and smaller administration units attached to each of the four other divisions.

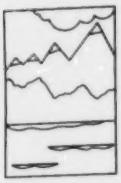
Library, financial, communications, human resources and related functions are performed by the Common Services Division. The library provided information to staff through reference searches, collection development, inter-library loans and similar services.

Former Research Management Division responsibilities were integrated into the centre's operation. Externally funded research programs, totalling $92,000, were administered. Administration and control of the centre's $10.9 million budget involved operation of an accounts section, a central stores facility and a central duplicating facility.

The communications section conducted tours for about 2,000 people. A promotional video on the centre was completed. The Common Services Division coordinated the centre's participation in the provincial Environment Week program.

Human Resources staff were active in payroll, classification, training, and other staff-related duties. An active Occupational Health and Safety Program was maintained, and an Emergency Response Team remained trained and prepared. Programs and training in Transportation of Dangerous Goods, and Workplace Hazardous Material Information System training were planned and implemented.

FINANCE, ADMINISTRATION, AND LAND RECLAMATION SERVICES



Wm. Simon, CMA
Assistant Deputy Minister

J. M. King
Director
Land Reclamation Division

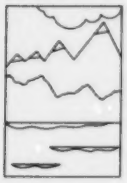
E. A. Luczak
Director
Financial Operations Division

D. Lougheed
Director
Systems and Computing Division

R. Duffy
Director
Financial Planning Division

Finance, Administration, and Land Reclamation Services provides administrative and support services to the department in the areas of financial planning, financial operations and systems and computing. As well the Assistant Deputy Minister is responsible for the Land Reclamation Division and its related interdepartmental functions.

The Assistant Deputy Minister of Finance, Administration, and Land Reclamation Services is a member of the department's executive committee and is the senior financial officer of the department charged with the responsibility of administering the Financial Administration Act. This involves establishment of a system of efficient internal controls, developing a code of accounts to satisfy both central agency and departmental requirements, satisfying financial reporting needs of department personnel and advising expenditure officers on expenditure monitoring and control.



FINANCIAL OPERATIONS DIVISION

The Financial Operations Division provides centralized financial services to the department. These services include the development and implementation of financial and accounting policies and procedures to ensure compliance with the provisions of the Financial Administration Act and related Treasury Board directives. Division staff provide assistance and advice in the areas of expenditure and revenue accounting, fixed asset management, financial systems development and internal systems review services.

Accounting Branch

The branch develops, implements and maintains departmental accounting and financial reporting systems. Responsibilities include payment of all vendor accounts, control and reporting of assets and liabilities, collection of accounts receivable, and the review and approval of all departmental contracts, grants and agreements.

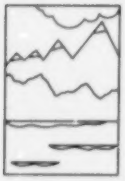
Financial Advisory Branch

The branch provides advisory services to divisions on accounting, financial and administrative policies and procedures.

Responsibilities of the branch include conducting internal financial reviews of departmental systems and liaison with the Office of the Auditor General and Alberta Treasury to ensure compliance with government guidelines, directives and legislation.

Fixed Assets Branch

The branch is responsible for the development and implementation of policies, procedures and systems to ensure adequate control and efficient management of departmental fixed assets. The branch is also responsible for providing financial consultation to the Land Conservation and Reclamation Council, maintaining financial records and preparing the annual Surface Reclamation Trust Fund financial statement.



ADMINISTRATIVE SUPPORT DIVISION

This division provides office support services to the department and its program areas. The division is also responsible for co-ordination and development of the departmental records management program.

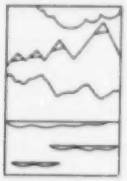
Office Support Services Branch

The branch provides central duplicating, courier and mail services, building maintenance, security and other support services in Edmonton central office. Telecommunications, furniture, photocopying, facsimile and diazo equipment services are also provided in both Edmonton and regional offices.

Records Management Branch

The branch coordinates and develops the records management program as legislated under the Public Works, Supply and Services Act. Significant advances were made in the management of both active and semi-active records such as the development of policies and standards. The organization of the records management program was strengthened through the appointment of records officers in each division.

Staff training was offered in Edmonton, Calgary and Lethbridge and a new course was developed in co-operation with Systems and Computing Division.



LAND RECLAMATION DIVISION

The division administers The Land Surface Conservation and Reclamation Act and regulations.

The division reviews applications and impact assessments of proposed developments which disturb land and grants conditional approvals which set land reclamation standards. Staff also carry out inspections, reclamation projects and special studies to enforce and improve reclamation and environmental planning.

This division administers the Surface Reclamation fund which is comprised of security deposits paid by developers to encourage satisfactory reclamation of disturbed land.

Land Conservation and Reclamation Council

The Council is responsible for ensuring that the construction, operation and abandonment of well sites, access roads, pipelines, transmission lines, sand and gravel, coal and oil sands operations are performed in such a manner as to return the land to the same productive capability that existed prior to the disturbance. There are 21 provincial and 163 municipal government reclamation officers within the council.

During 1988-89 reclamation officers monitored the operation of 801 development and reclamation approvals and 19 exploration approvals and issued 60 reclamation orders and 1344 reclamation certificates on abandoned surface disturbances.

Development and Reclamation Review Branch

The branch administers three inter-departmental committees, the Development and Reclamation Review Committee, the Crown Mineral Disposition Review Committee, and the Exploration Review Committee. Branch staff act as chairpersons for the committees.

Development and Reclamation Review Committee

The Development and Reclamation Review Committee is an inter-departmental committee which carries out detailed technical reviews of major coal and oil sands development applications. The committee recommends operational terms and conditions for development and reclamation approvals issued by the Minister.

During 1988-89 five new development and reclamation approvals were issued for the following: Luscar Ltd. for the Tofield Coal Mine, Smoky River Coal Limited for the No. 11 Mine, Esso Resources Canada Ltd. for the OSLO oil sands mining project, Norcen Energy Resources Limited for the Hilda Lake Pilot Project, and Suncor Inc. Resources Group for the Fort Kent Thermal Project.

The bulk of the committee's work involved reviewing applications for amendments to existing development and reclamation approvals. A total of 44 amendments were issued during 1988-89, three to oil sands mining operations, 19 to coal mines, and 22 to oil sands in situ developments.

Crown Mineral Disposition Review Committee

The Crown Mineral Disposition Review Committee reviews requests for sales of mineral rights that are the property of the Crown to ensure that serious environmental effects are avoided. In certain cases, lands are requested to be withdrawn from sales.

In 1988-89 the committee reviewed 56 schedules relating to coal, oil sands, quarriable minerals, metallic minerals, and placer minerals. Oil and gas leases constituted most of the work load. The committee has continued to review administrative procedures to improve its efficiency.

Exploration Review Committee

The Exploration Review Committee carries out detailed technical reviews of coal exploration applications. It recommends operational terms and conditions for exploration approvals issued by the Minister.

During 1988-89, the committee reviewed and recommended approval for 11 applications.

Regulated Operations Branch

The branch reviews pipelines, electric transmission lines, industrial environmental impact assessments (EIA) and gravel operations applications. An interdepartmental review of regulated pipeline and gravel operation applications and high voltage electric transmission line projects is also coordinated by the branch. After the review, approval conditions are recommended to the chairman of the Land Conservation and Reclamation Council.

Linear Projects Section: This section is responsible for the interdepartmental coordination of the review of major electric transmission lines and oil and gas pipelines referred by the Energy Resources Conservation Board (ERCB). The section also makes recommendations to the chairman of the Land Conservation and Reclamation Council for Development and Reclamation and ministerial approvals. The section also reviews water and sewer pipeline projects and environmental impact assessment reports for major industrial developments. Section staff represent the Crown at ERCB hearings on pipeline and transmission line projects.

During the past year the section attended seven hearings to cross examine applicants and interveners on environmental protection matters. The section reviewed ERCB decision reports and evidence presented at the hearings prior to making recommendations for approval. The type and number of projects reviewed and approved during 1988-89 are included in Table 1.

Sand and Gravel Section: Under the Sand, Gravel, Clay and Marl Surface Operations Regulation, all large sand, gravel and clay operations on patented land in the province require a development and reclamation approval.

An inventory and notification program to record all operations and to notify the landowners and holders of a gravel lease of the regulation requirements was continued during the year. The program will continue until all operations on patented land have been recorded and all active operations have received development and reclamation approval.

In 1988-89, the program focussed on five municipalities which contained 228 gravel operations, of which 49 required development and reclamation approval. To April 1, 1989, 2,325 pit operations have been recorded in 44 municipalities with 700 requiring approval. The remaining operations were either inactive or were of a minor size which did not require approval.

During the reporting period, 70 applications for development and reclamation approval were reviewed. There were 91 new and 42 renewal approvals issued to private developers, counties, Alberta Transportation and Alberta Environment operations. The sand and gravel referral system reviewed 85 proposed highway projects submitted by Alberta Transportation.

Reclamation Branch

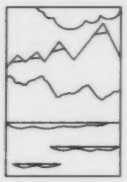
The Reclamation Branch was amalgamated to include the research and operational components of the Alberta Heritage Savings Trust Fund Land Reclamation Program.

The operational reclamation section of the branch performs actual reclamation of derelict sites to return the land to productive use. Of the 75 sites reclaimed this fiscal year, 59 were located on municipal land and 16 on Crown land (see Table 2). The majority of the operational projects undertaken are abandoned garbage dumps, landfills, sewage lagoons, and gravel/sand pits, located on municipally owned land.

The Blairmore Coal Slack Pile reclamation project was close to completion at the end of this fiscal year and has cost approximately $2.65 million to date. This project, which saw approximately 600,000 tonnes of coal slack reclaimed and the site returned to beneficial use, was funded using general revenue money.

The reclamation research program identifies better methods of reclaiming disturbances created by activities such as mining, drilling and pipeline construction. The interdepartmental Reclamation Research Technical Advisory Committee (RRTAC) sets research priorities that are reviewed each year. Committee members are from Alberta Environment, Alberta Agriculture, Alberta Energy, Alberta Forestry, Lands and Wildlife, and the Alberta Research Council.

In 1988-89, RRTAC committed $280,000 from the Heritage Savings Trust Fund to reclamation research. Government and industry committees coordinate research in three program areas plains coal, oil sands, and oil and gas. Twelve final reports were published and are available from the Queen's Printer.



FINANCIAL PLANNING DIVISION

The Financial Planning Division was restructured in May, 1988. It provides a diverse number of services both to the department and to the public through three branches, Budget and Forecast, Education and Library Services.

Budget and Forecast Branch

The branch compiled the 1989-90 Alberta Heritage Savings and Trust Fund departmental budget of $42,317,000 and the 1989-90 general revenue budget of $93,089,000. The branch also coordinates budget submissions for capital construction and accommodation.

The branch monitored the 1988-89 departmental general revenue and Alberta Heritage Savings and Trust Fund expenditures and provided management of departmental space needs and insurance requirements.

Environmental Education Branch

The branch continued to develop educational materials and provide educational services to the public through schools, post-secondary educational institutions, youth groups and community organizations. In addition, the branch developed and coordinated the department's Environment Week program. Branch responsibilities included liaison and coordination with several organizations such as the Joint Committee on Environmental Education, the Environmental Education Advisory Committee to the Environment Council of Alberta, the Friends of Environmental Education Society of Alberta, the Environment Week Association of Alberta, the Environmental and Outdoor Education Council and the Science Council (both of the Alberta Teachers' Association).

Programs in development or implemented during 1988-89 include the following:

The Water Literacy Program: a comprehensive in-school education program for grades 4-12 was introduced. Units for elementary grades 4-6 were distributed through workshops to more than 500 teachers. The program deals with all facets of water in Alberta including sources, uses, management of supply and water quality. The units support the science curriculum in Alberta schools.

The Home We Share: This poster and teaching activity package continued to be a very popular product for 1988-89. Some 30,000 additional copies (70,000 in 1987-88) were printed and distributed along with 2,000 sets of the teaching package.

Let's Recycle: This poster and teaching activity package was developed as the second in the series (The Home We Share poster). A print of 40,000 copies and 2,000 activity packages were collated to prepare for the 1989-90 year.

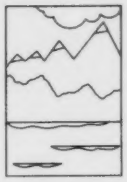
Environment Week Program: The department's Environment Week Program helped more than 1,000,000 Albertans become more aware of the environment. The branch was responsible for coordinating a program that included the following:

- more than 500 staff participating across Alberta
- more than 650 classrooms being "adopted" by Alberta Environment employees who presented to in excess of 12,000 children in all grades
- a tour of environmental displays, talks, and demonstrations by more than 20 staff to five communities in northwestern Alberta
- the delivery of more than 500,000 pieces of information and educational material to Albertans
- more than 75 displays and demonstrations in some 50 communities across the province

Library Services Branch

The branch provides information resources for departmental research, program and policy-making needs. Private industry, other government agencies, environmental interest groups, members of the public and students of post-secondary educational institutions also make use of its resources. Services provided include the following: purchase of all books, documents and periodicals for the department, organization of these materials for maximum retrievability and accessibility; and dissemination of these information resources through current awareness, reference, computerized information retrieval, and interlibrary loan activities.

Staff of the Library Services Branch responded to more than 27,000 requests for information on environmental topics. As in previous years non-departmental users continued to make significant demand on Library resources and staff time, accounting for more than half of all information requests.



SYSTEMS AND COMPUTING DIVISION

The Systems and Computing Division supports all departmental programs in planning, development, operation, and maintenance of computer programs and systems. The division also provides computing facilities and trains departmental staff to use computer equipment and programs.

EDP Planning and Office Automation Branch

The branch develops computer systems and departmental electronic data processing plans. The branch also conducts feasibility studies concerning computer systems and develops and implements word processing, electronic mail and electronic filing systems.

Systems Development Branch

The branch is responsible for managing projects involving the development and enhancement of large and medium scale computer systems. The branch develops detailed system requirements, designs the system, and handles programming and implementation. The branch provides technical support and advice on telecommunications, data base and electronics.

Systems Operations Branch

The branch keeps operational systems up-to-date and operating reliably and efficiently. The branch also develops smaller systems, enhances and maintains all general-use equipment. It provides a consulting service to staff on operational problems.

Current Systems

Some 20 data systems and 40 scientific computer programs are maintained by the department. The systems contain air quality, water quality, hydrometric, climatological and ground water data used in the department's monitoring, assessment and regulatory activities.

Technical/engineering computer programs are used to delineate river floodplains, forecast river flows and predict pollutant concentrations.

Computer programs are used by technical staff to analyze data and assemble reports; word processing and spreadsheet programs are widely used to prepare administrative information and technical reports. Administrative systems, such as a contract registry, ground water well and water resource administration system are also operated by the department.

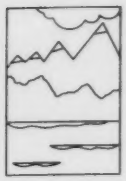
Projects Completed

Improvements were made in the office automation area and technical data analysis areas. Assistance was provided to the Water Supplies Assistance Program and the Management of Underground Storage Tanks program. Workstations were also installed to improve word processing capabilities and to assist in report, document and licence preparation and administrative tasks.

Co-ordination and Planning

The department and Environment Canada continued exchanging data and systems technology. These exchanges involved water quality, air-monitoring and hydrometric data. The department has access to Canada Land Inventory data, indexes of available satellite and air photo imagery, to data about municipal water and wastewater treatment facilities and to information about special wastes and pesticides.

ENVIRONMENTAL PROTECTION SERVICES



K. R. Smith
Assistant Deputy Minister

F. Schulte
Director
Environment Assessment Division

J. C. Lack
Director
Standards and Approvals Division

Dr. B. Taylor
Director
Wastes and Chemicals Division

A. Shulz
Director
Pollution Control Division

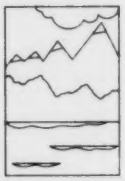
Environmental Protection Services works to ensure that Alberta Environment's mandate for the protection, improvement and wise use of our environment now and in the future is accomplished.

The service ensures that thorough environmental evaluations are carried out prior to development of projects and a high priority is placed on preventing problems through planning. Stringent standards for environmental protection are required to ensure that the generation of contaminants and their release to the environment are minimized.

Another key responsibility of the service is monitoring of the environment, principally air, water, soil, wastes and pesticides, to ensure standards are followed and that environmental quality is maintained. Where necessary, enforcement activities are carried out to ensure compliance with standards. Research activities focus on finding applied solutions for environmental problems.

The service administers grants to local authorities in developing regional waste management facilities and non profit organizations in establishing recycling centres.

During the year the Pollution Control Division was restructured in accordance with recommendations made by the Task Force on Environmental Law Enforcement in Alberta. The division has two branches, Investigations and Compliance.



ENVIRONMENTAL ASSESSMENT DIVISION

The Environmental Assessment Division is responsible for the detailed environmental evaluation of major resource development initiatives through the environmental impact assessment (EIA) review process.

EIAs are required for most major resource developments such as new oilsands mining projects, sour gas processing plants, coal mining projects, power plants, refineries and petrochemical facilities, pipelines, transmission lines, recreational developments, and water resource projects.

The division is responsible for facilitating public participation in environmental issues and in programs administered by Alberta Environment.

The division administers restricted development area (RDA) regulations which designate transportation utility corridors and areas requiring special environmental protection.

Planning, development and coordination of departmental programs for monitoring ambient air and water quality are undertaken by the division. The division is also responsible for developing and recommending ambient objectives for chemicals in air, water, soil and sediment.

Environmental Impact Assessment Review Branch

This branch evaluates proposals to determine if EIA reports are needed, specifies the scope and content of EIA documentation and coordinates interdepartmental review of these projects.

During the 1988-89 fiscal year, the branch dealt with 102 project reviews, of which 92 were new referrals (see Table 3). Ten project reviews were carried over from the previous year. The branch reviewed 29 major projects, including carry overs and new referrals. EIAs were required for 19 of these major projects, three coal mines, eight industrial plants, two gas plants, four oil sands projects, one water resource project, and one linear development. Five EIA reviews were completed, 13 are active and one is inactive.

A total of 81 project reviews were completed, 20 are still active and one is inactive.

A major branch undertaking was attendance at public meetings and speaking engagements to explain the environmental review process for pulp mill development.

The director of the division administers the Subsidiary Agreement Concerning Environmental Impact Assessments of Projects in Alberta With Implications for Canada and Alberta. The branch exchanged information with Environment Canada on a number of projects which have interjurisdictional environmental implications. All projects requiring EIAs were referred to Environment Canada. The subsidiary agreement expired in May 1989 and the Branch participated in a review to examine the agreement's effectiveness.

Community Affairs Branch

The branch is responsible for facilitating public involvement in departmental projects and regulatory procedures.

Environmental Impact Assessment: Communities were assisted through responses to information requests and advice on environmental issues and the regulatory process. Branch staff advised proponents on the requirements for public participation programs and monitored programs for conformity to the intent of the environmental impact assessment (EIA) guidelines on public involvement.

The branch responded to requests from individuals and community groups planning to intervene at Energy Resources Conservation Board hearings where an EIA was required as part of the proponent's application. Branch staff were involved in eight projects requiring EIAs. These included five pulp mill projects, two road construction projects and one sour gas project.

Departmental Projects: Branch staff aided citizen participation in many departmental water resource projects, including Wabamun Lake Level Stabilization, North Saskatchewan River Basin Planning Program, Athabasca River Basin Planning Program, Lac La Biche Lake Level Stabilization Feasibility Study, Irrigation Limits Open Houses, Whitford Lake Water Management Study, and the Pembina River Valley Floodplain Management Study.

The Department's Help End Landfill Pollution (H.E.L.P.) Program was assisted by branch staff on community approaches at orphan sites. Assistance in designing and implementing public consultation programs for licensing was provided to other divisions in the Environmental Protection Service.

The branch worked with many community groups on a variety of environmental issues. Some of these organizations were the following: Ft. McKay Interface Committee, Quirk Creek Community Gas Plant Committee, Oldman River Dam Local Advisory Committee, Alberta Coalition for Forest Spray

Alternatives, Norcen Carbondale Advisory Committee, Community Advisory Committee of Cold Lake, Friends of the Peace, South Peace Environmental Association, Caroline Gasfield Advisory Board, Pelican Spruce Public Advisory Committee, East Parkland Liaison Committee, the Alberta Environmental Network, and Ft. McKay Environmental Community Education Committee.

A considerable contribution was made by branch staff to the organizing and implementing of Environment Week activities throughout the province.

Standards Research and Development Branch

In keeping with Alberta Environment's mandate "To achieve the protection, improvement and wise use of the environment, now and in the future," and with recommendations from the Review Panel on Environmental Law Enforcement in Alberta, the Standards Research and Development Branch was established. The branch developed provincial ambient objectives for both chemicals and traditional parameters in various environmental media (air, water, and soil/sediments).

The branch has drafted a procedure to be used in developing an ambient objective for any chemicals and traditional parameters. Public involvement is a key component in the process.

The branch was also involved in coordinating completion of the report, "An Approach to the Determination of Effective Acidity" for the Western and Northern Canada Long Range Transport of Air Pollutants (W&NC-LRTAP) Task Group.

Environmental Quality Monitoring Branch

The Environmental Quality Monitoring Branch (EQMB) collects, analyzes, assesses and reports ambient air and water quality conditions. The branch provides reliable environmental quality data to protect air and water quality, and to describe background conditions and assessments in support of licensing and other regulatory functions.

The Branch's three sections are Water Quality, Data Management and Air Quality.

Water Quality

Surface water quality programs conducted by the Branch in 1988-89 fell into three functional categories, ambient water quality surveys, ambient long-term monitoring, and impact assessments.

Five lake survey programs were conducted in 1988-89. A cooperative program between Alberta Environment and Alberta Recreation and Parks resulted in 20 lakes being sampled.

Another program was initiated in cooperation with the Alberta Association of Summer Villages to train members of the public in basic lake sampling techniques and to increase public awareness of lake water quality. Lac Ste. Anne and Pigeon Lake were successfully sampled in this Volunteer Citizens' Lake Survey Program.

Some 47 water bodies were sampled in northeastern Alberta to determine specific information on sensitivity to acidic deposition. Seven other lakes were sampled to provide data for various departmental programs.

Four major river survey programs were conducted during 1988-89. The Peace and Athabasca rivers were sampled during open-water and ice-cover periods to provide data for assessments related to industrial development and licensing. The North Saskatchewan River was also sampled during winter and summer to provide information to assess both municipal and industrial discharges on downstream water quality. The Elbow River, which flows into the Glenmore Reservoir in Calgary, was surveyed to determine the effect of upstream land use and residential developments on the reservoir, which is a major source of drinking water for Calgary.

Ethel, Wabamun, Nakamun, and Baptiste lakes, representing four morpho-edaphic lake types, have been sampled monthly since 1980 to monitor long-term trends in specific trophic variables. Two small, poorly buffered, unnamed lakes on the Muskeg Mountain Uplands were added to the long-term lake network in May 1988 in order to monitor the effects of acidic deposition.

An extensive long-term river network has been in place since the 1960s. In 1988, there were 12 active stations being sampled at monthly intervals. The branch maintained a robot monitoring system which provided hourly readings from remote sites by telemetry to head office.

The branch provided data and/or assessments of three major water management schemes in southern Alberta for Water Resources Management Services. The branch was also instrumental in the derivation of critical loads of acidic deposition for lakes throughout Alberta. A major consolidation of lake water quality data into an "Atlas of Alberta Lakes" was co-managed between EQMB and the University of Alberta.

In northern Alberta, much emphasis was placed on the assessment of industrial impacts on the mainstems of the Peace and Athabasca rivers at the proposed sites of the Daishowa and Millar Western pulp mills. A comprehensive survey of the Lower Athabasca River and Delta (water and sediments) was also conducted in 1988.

Data Management

Data Management maintains the branch's environmental databases and provides data retrieval and statistical analysis services. A major function of the unit is to distribute air and

water quality monitoring data in response to public, government, university and consultant requests.

During the past year there was an increased interest in monitoring data, especially water quality data from the Athabasca and Peace river basins. The size of the data requests varied from individual citizens interested in specific locations, to consulting companies working on air quality in Northern Alberta or water quality for entire drainage basins.

Air Quality

Urban Air Quality Monitoring

The air quality monitoring network for Edmonton and Calgary consists of continuous monitoring stations and static monitors. Three permanent fixed continuous stations with instrumentation to detect carbon monoxide, coefficient of haze, oxides of nitrogen, nitrogen dioxide, ozone, hydrogen sulfide, sulfur dioxide and total hydrocarbons are located in Edmonton and Calgary. An air quality index (IQUA) based on levels of the most significant air pollutants (smoke, nitrogen dioxide, carbon monoxide, ozone and sulfur dioxide) was released twice daily to the media and the public. The static monitoring network consists of 67 total sulfation stations, 43 dustfall stations, three fluoride stations and six high-volume samplers.

The monitoring network for smaller urban centres consists of one high-volume sampler, 30 total sulfation, 16 hydrogen sulfide, 17 dustfall and two fluoride exposure cylinder stations. A fixed continuous multi parameter station is located at Fort Saskatchewan.

Rural Air Quality Monitoring

Fixed continuous multi parameter monitoring stations are operated in Fort McMurray and Fort McKay. A network of 151 hydrogen sulfide, 156 total sulfation, 19 dustfall and four fluoride exposure cylinder stations were maintained near rural industrial operations. An air pollution meteorological monitoring station was operated near Fort Saskatchewan to provide boundary layer data acquisition.

Monthly precipitation samples were collected and analyzed at 13 locations as part of an assessment of acid deposition in Alberta.

Land Use Branch

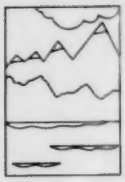
The Department of the Environment Act provides for the designation of restricted development areas (RDAs) in the province. The two main reasons for RDA designations are the need for special environmental management in certain areas and for protection of transportation/utility corridor lands. There are now 10 RDAs which are administered by the Land Use Branch.

Subdivision and development applications and most proposed land-use changes are reviewed to determine whether they conform to the regulations set up for a specific RDA and ministerial consent is required before there can be any change in land use. During the past year, 125 requests for ministerial consent were received; 81 were approved, three were refused, and four did not require consent. The remainder were either awaiting decision, withdrawn or regarded as information (See Table 4).

The branch also evaluates proposals for subdivisions and for a wide variety of land uses. Comments are provided to local planning authorities throughout the province. Applications for changes in land use and subdivision are referred to the branch by the 10 regional planning commissions, the Planning Services Division of Alberta Municipal Affairs, the cities of Airdrie, Camrose, Leduc, St. Albert, Fort McMurray, Fort Saskatchewan and Lethbridge, the counties of Grande Prairie, Parkland and Strathcona, the Municipal District of Rocky View and Improvement District #5.

The branch comments on behalf of the department on compliance with the Land Conservation Guidelines, susceptibility to flooding, bank and slope stability, risk of erosion, surface drainage, availability of domestic ground water supply, potential air and water pollution and suitability of the soil for sewage disposal.

Branch staff assessed a number of major residential and cottage resort subdivisions near water. In 1988-89 the number of applications processed increased from 1,379 in the previous year to 1,712. Staff represented the department at Alberta Planning Board hearings on subdivision application appeals by developers. Staff also reviewed 16 applications for annexation of rural lands to urban municipalities as a result of referrals from the Local Authorities Board (see Table 5).



STANDARDS AND APPROVALS DIVISION

The Standards and Approvals Division reviews industrial and municipal applications for permits to construct and licences to operate for new and/or existing facilities in accordance with The Clean Air Act, The Clean Water Act and regulations. Permits are issued for new facilities and for alterations to existing operations once the division is satisfied with the proposed environmental protection program. Licences specify operating, monitoring and reporting requirements which must be followed by the operating facility. The division establishes drinking water standards and prepares amendments to The Clean Air and Clean Water Acts and regulations as required.

Air Quality Branch

The Air Quality Branch seeks to achieve and maintain acceptable ambient air quality through the use of the Clean Air Act and regulations, guidelines, and policies applied to industrial and other commercial operations.

Continued assessments of possible air quality impact from new industrial developments and from expansion phases of existing facilities confirmed that acceptable air pollution control systems were being applied and used. As required under legislation, assessment of existing industrial operations for licensing was also a major part of the total workload for the year.

A total of 113 permits and 361 licences were issued under The Clean Air Act during the year (see Table 6). In addition, there were a total of 14 amendments to permits and 107 amendments to licences.

Staff continued to participate in Energy Resources Conservation Board (ERCB) hearings and inquiries. The branch was active on several committees dealing with acid rain causing emissions. The branch participated in the DART process for the Suncor debottlenecking project and also participated on the Fort McMurray Regional Air Quality Coordinating Committee (RAQCC). Branch staff, in cooperation with the ERCB, were involved in developing a new (draft) guideline for development plans and atmospheric emissions in the heavy oil industry sector. The branch was involved in pulp mill developments at Hinton, Whitecourt, Peace River, Grande Prairie, and Slave Lake.

Flaring Committee

The Government Industry Consultative Committee on Flaring (GICCOF) reviewed the current flaring technology and its industrial practice in Alberta in order to identify any research needs or regulatory changes that will benefit the environment in Alberta. Two studies on current technology and current practice were conducted and industry representatives provided input and coordination.

Water Quality Branch

The Water Quality Branch seeks to maintain acceptable quality for Alberta's surface and ground waters by regulating pollution sources. Branch staff assess industrial proposals and issue approvals for the design, construction and operation of industrial facilities and other operations; initiate and participate in studies and developments which determine and lessen the impact on water quality in the province; and continue to develop and update provincial industrial water emission standards.

A great deal of staff effort is put into assessing new and existing industrial plants and operations to ensure that they are environmentally acceptable. Last year a total of 69 permits and 265 licences were issued for the construction and operation of new and existing industrial facilities (see Table 7); 43 letters of permission permitting the non-routine discharge of liquid effluents were granted; and 27 livestock operations were reviewed for environmental input.

Review of continuing and recent pulp and paper industry development proposals required major and concentrated branch activity in the development of standards and assessing the impact on water quality.

During the year, branch staff coordinated additional reviews of existing industrial facilities to determine the impact of operations on surface and ground water quality and to identify areas where improvement was necessary. Staff participated in the following activities: ERCB hearings, meetings with various Regional Planning Commissions, local municipal governments, and other agencies to provide environmental input to the planning process for intensive livestock developments; and pursued the development of mixing zone, initial dilution zone and predictive water quality effects models for computer application. Other areas of involvement were in river basin planning studies, researching new industrial process and waste water treatment technologies and microbiological assessments of agricultural waste management practices. The branch also continued review of existing industrial performance guidelines.

Branch participation and input was also provided early in the environmental assessment review process for several major chemical and petrochemical developments and industrial expansions.

This input at the pre-design stage enabled introduction of the most appropriate and beneficial environmental controls, practices and technology.

Municipal Branch

The Municipal Branch works to protect and improve public health and the environment by ensuring that municipalities and other types of municipal developments take proper measures to provide safe drinking water and good sewage treatment and proper effluent disposal. The Municipal Engineering Branches of the Pollution Control and Standards and Approvals Divisions were consolidated into a new Municipal Branch in 1988. The new branch was structured to deliver the following programs: standards development; project reviews and issuance of approvals; field inspections/monitoring and review of system performance information; and the certification and training of water and wastewater operators.

Standards development and updating continued to be a cornerstone activity of the branch, and in April, 1988 new *Standards and Guidelines for Municipal Water Supply, Wastewater and Storm Drainage Facilities* were published. Near the end of the 88-89 fiscal year, the branch initiated preliminary revisions to these standards based on feedback from municipalities and consultants.

The following are some of the other standards-related activities that were undertaken in the 1988-89 fiscal year:

A chapter of the Water Treatment Applications Guide was completed by the University of Alberta. This fulfilled a commitment by Alberta Environment to assist the federal government and other provinces in developing a manual on applicable drinking water technologies; and

Work began on a Risk Management Strategy for municipal and industrial plant approvals. This report will be finalized in the 1989-90 fiscal year.

Ensuring the adequacy of existing municipal water and wastewater works in the province through review of system designs, the issuance of permits to construct, and the establishment of operating requirements in licences to operate continued to be a major activity of the branch. The branch also continued to work to control all chemicals and products used in public water supply systems through issuance of letters of 'No Objection to Use' to manufacturers and letters of permission to municipalities.

During the 1988-89 fiscal year, 261 permits to construct and 152 new or renewed licences to operate were issued for public water and wastewater systems in the province (see Table 8).

In addition to these approvals, eight letters of 'No Objection to Use' were issued to manufacturers and distributors of water treatment chemicals. Letters of permission were issued for 25 sludge application or wastewater irrigation projects, 13 experiments to evaluate new chemicals or treatment technologies, and six miscellaneous projects such as dye tracer studies.

Field related activities undertaken in 1988-89 included physical inspection of water and sewage facilities, training and technical assistance to operators, assessment of plant performance relative to licence conditions or relevant regulations, and monitoring of drinking water and sewage effluents.

Of note in 1988-89 were improvements in overall compliance by municipalities to monitoring and reporting requirements outlined in the licences to operate. Various routine sampling programs were continued, including the comprehensive monitoring of selected treated water supply and split sewage sampling with select municipalities. Several special surveys were undertaken in response to public concerns, including a program to sample for lead in school fountains to assess possible risks to children. It was concluded that lead in school fountains was not a significant problem. Another special survey related to dioxin/furan monitoring of select communities on the Athabasca and Peace Rivers. There were concerns that existing pulp and paper operations may have an impact on downstream water supplies; the study detected no impacts.

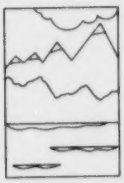
Administration and delivery of a Certification Program and a Training Program for municipal water and wastewater operators continued to be another major responsibility of the Municipal Branch.

The certification program for water and wastewater operators is designed to ensure that the province's municipal facilities are operated by qualified personnel. Table 9 gives an indication of the activities in this area.

The program also provides certification for operators of water distribution and wastewater collection facilities.

The training program also supports the Certification Program, provides training for new municipal operators; and updating for existing operators.

Table 9a shows the number of municipal operators who attended various training programs throughout the year.



WASTES AND CHEMICALS DIVISION

Industrial Wastes Branch

The branch administers the Hazardous Chemicals Act and regulations related to the management of hazardous wastes.

The branch also deals with industrial solid waste management, decommissioning and clean-up of industrial plant sites and co-ordination of the department's input into sanitary and municipal landfill approval processes. The branch works with federal/provincial committees set up under the auspices of the Canadian Council of Ministers of Environment (CCME) to establish national policies on waste management.

Hazardous Waste Management: The branch ensures that the Hazardous Waste Manifest Program provides accurate and timely information in compliance with the Hazardous Chemicals Act requirements for tracking hazardous waste shipments. Information on hazardous waste inventories in Alberta is also provided. More than 10,000 manifest applications/submissions and 2,500 identification number applications (generators, carriers and receivers) are received and processed annually.

In addition, the branch consults with industry, government agencies and the public on Alberta Environment's hazardous waste management programs, policies and legislation. These services include assessment of industrial and hazardous wastes, advice on techniques to treat and dispose of hazardous wastes, and evaluation of proposed technologies.

Industrial Waste Management: The branch conducts inspections of industrial plant sites and acts as the licensing group on matters related to industrial solid waste management. Services range from providing advice to the Standards and Approvals Division on various proposals to reviewing and drafting approvals on applications for land treatment and disposal of industrial wastes.

In 1989, the branch inspected approximately 70 facilities and provided comments, reviews or draft approvals for some 250 applications/projects.

Decommissioning: Guidance is provided to industry and other government agencies on clean-up and decommissioning of industrial plant sites. This includes site assessments and approval of plans for remedial actions required to recover soil and ground water contaminated as a result of industrial activities.

CCME: The branch provides representation and input to federal/provincial committees and working groups which are developing national policies, standards/guidelines, and legislation on waste management.

Pesticide Management Branch

The Pesticide Management Branch provides a comprehensive pesticide management program in the following areas: training and licensing; issuing and monitoring of permits for the use of restricted pesticides and the use of pesticides in environmentally sensitive areas; enforcement of the Agricultural Chemicals Act; and administration and coordination of technical and financial assistance programs.

Training & Licensing: Approximately 100 individuals attended licensing courses and workshops held in Fairview, Olds and Stony Plain. The home study programs offered by Lakeland College in Vermilion continue to form the principal route of licence certification for both pesticide applicators (approximately 150) and dispensers (approximately 140). Information programs on the forest tent caterpillar were organized in affected areas and a brochure entitled "Pest Control For Homeowners: A Responsible Approach" was released.

The branch processed 650 applicator and 120 vendor licences and certified 140 dispensers. Currently the branch licenses some 1,600 pesticide applicators, 2,000 pesticide dispensers and 350 pesticide vendors.

Permits & Monitoring: A total of 101 permits were issued for the application of pesticides in the Green Area. One experimental forestry herbicide permit was issued.

Some 230 permits were issued to apply pesticides on, in, or near water; and 117 inspections were conducted before, during or after the pesticides approved in these permits were applied. A total of 309 permits were issued for the application of restricted pesticides.

Monitoring programs were conducted for all forestry spraying programs. The most noteworthy projects were the continued monitoring of Forestry Canada's Pronone 10G research project near Grande Prairie and the monitoring of the Oldman River for selected pesticide residues.

The branch participated in two aquatic plant management studies. One assessed the use of the herbicide Sonar to control plants in irrigation ditches. The other study evaluated the use of fish (grass carp) to control plants in dugouts.

In the spring the branch monitored 93 pesticide container sites for pesticide contamination.

The branch assisted in a Canada-wide ground water well sampling program in potentially sensitive areas to determine if there were significant herbicide residue levels in potable water wells.

Enforcement: During this period, the Pesticide Management Branch conducted 160 investigations into suspected contraventions of the Agricultural Chemicals Act and its regulations and 19 letters of compliance were issued as a result.

The branch also carried out 766 retail pesticide vendor inspections and 80 licensed pesticide applicator inspections. As a result of these inspections, 229 letters of compliance were issued.

Biting Fly Control Financial Assistance Program: Grants totalling $507,500 were awarded to 33 municipalities (total population 1.64 million) which participated in the 1988 Biting Fly Control Financial Assistance Program. Two new programs were initiated in 1988 and five programs were discontinued. Section staff advised or attended meetings to discuss mosquito control and financial aid with several other communities who did not participate in the program.

A mosquito biology workshop for municipal control program staff was held at the University of Calgary. In addition, branch staff conducted a mosquito control training course at Olds College for the Department of National Defence.

Pesticide Container Disposal Program: A Special Warrant for $2.9 million was approved in December 1988 to clean-up and upgrade pesticide container collection sites.

Some 123 container sites were cleaned and grants were provided to 68 authorities to upgrade container sites.

Studies were undertaken to assess the feasibility of recycling used metal and plastic containers and to examine occupational health and safety.

A provincial Pesticide Container Disposal Committee was also formed to provide direction on and assess the future of the program.

Recycling Branch

The 1988 reorganization of Environmental Protection Services created the Recycling Branch, reflecting the department's commitment to recycling.

The Recycling Branch's programs include communications and education; residential/light commercial; and industrial. The branch promotes the "4Rs" of waste management - reduce, reuse, recycle and recover by offering general waste management and technical information to the public, municipalities and industry. Requests for information on recycling and waste reduction continue to increase in all program areas.

Resource Recovery Grant Program: The Recycling Branch encourages non-profit groups and municipalities to establish recycling projects. The Resource Recovery Grant Program provides grants to assist these activities. Some 26 projects were approved from April 1, 1988, to March 31, 1989. The majority (13) were for newsprint collection projects. Individual grants ranged from $5,000 to $46,000, for a total of $445,497.00 during the year. A few special projects received financial support, such as Medicine Hat's backyard composting project and Paper Chase, a non-profit organization that collects high quality bond type paper from government and business office buildings in Edmonton.

Branch staff have worked closely with a number of municipalities which have been trying to establish comprehensive recycling programs. The City of Edmonton's successful Blue Box Program is one example.

Soil Protection Branch

The Soil Protection Branch seeks to protect, improve, and promote the wise use of our soil resource. Major branch programs relate to land spreading of wastes, reclamation of land affected by industrial activities, acidic deposition, and soil and ground water laboratory support for these programs.

Land Spreading of Municipal and Industrial Wastes: Investigations into the suitability of land spreading of municipal and industrial wastewater and sludge continue to be a major branch activity.

The cities of Calgary and Edmonton continued their programs of annually applying sewage sludge to agricultural land. An exploratory investigation was undertaken in the Edmonton area to assess land suitability for continued sludge application. Calgary initiated study plans to address nitrogen loading management. Studies were also undertaken for some 15 other communities to determine the suitability of their sewage sludge and land for sludge application. Spreading restrictions were identified for feasible schemes.

Most of the industrial wastes being assessed for land application are from the oil and gas or agricultural processing industries. Draft documents on drilling wastes characterization, drilling wastes disposal criteria and management options have been prepared by a government industry group.

Industrial Site Reclamation: The branch was active in a federal/provincial/industry group addressing clean-up of contaminated soil and ground water. Work to date has resulted in the development of a predictive model to help establish acceptable soil and ground water contaminant levels, and a descriptive

guideline outlining the concept and protocol for industrial site decommissioning and clean-up. Both model and guidelines are under review.

Development of acceptable soil and ground water criteria for gasoline and diesel fuel contamination began under the Management of Underground Storage Tanks (MUST) project. A newly formed national industry/government committee will evaluate and promote the development of biological clean-up techniques for hydrocarbon-contaminated soil and ground water.

Soil Acidification: Alberta continued its long-term soil monitoring program to evaluate impacts on non-agricultural soils in areas where deposition of acid precursors are expected. Eight years of data from the program were compiled and assessed with a finding of no obvious soil acidification.

Soil monitoring quality assurance was continued in support of Alberta Environment's requirement that sour gas plants monitor soils for acidification. The efforts of industry and the department to develop and implement a meaningful monitoring and assessment program have resulted in a mechanism whereby acidified soil areas can be more easily identified, as can the need for corrective action.

Analytical Support: Laboratory analyses of soil, water, plant and waste materials were conducted in support of the division's programs. Some 4,200 samples were analyzed for about 61,000 measurements. Of these, about 36,400 and 23,500 measures were made on 2,700 soil and 1,400 water samples, respectively.

Groundwater Protection Branch

The branch is responsible for protection of the province's ground water resources. Branch staff provide investigative and consultative services to the general public, industry and government agencies in a wide range of ground water contamination problems. The main programs currently undertaken by the branch include; Help End Landfill Pollution (HELP), Management of Underground Storage Tanks (M.U.S.T.), review of deepwell injection, hydrogeological cross-sections, landfill investigation, industrial plant monitoring and high quality water sampling. In addition, branch staff members were involved in numerous ground water contamination investigations, review of subdivision referrals and sewage lagoon proposals, and sampling and testing of pesticide container storage sites.

Help End Landfill Pollution (HELP): The project began in September 1986 in response to concerns about past industrial waste disposal practices. The project records, assesses and if necessary, cleans up former industrial landfills and plant sites in Alberta.

A total of 682 sites were assessed, and 13 abandoned "orphan" sites required investigation to determine potential threats to human health and the environment. Five of the sites are former wood preserving plants, five are former refineries and the remainder are oil/chemical disposal sites.

During the reporting year preliminary site investigation of the 13 sites was completed and studies are continuing.

Management of Underground Storage Tanks (M.U.S.T.): The M.U.S.T. Project is a joint undertaking of Alberta Environment and Alberta Labour, to address problems related to underground storage tank systems. The project is designed to reduce the frequency and magnitude of leaking underground storage tank systems; address abandoned underground tanks; and develop an improved management system for underground storage tanks.

Since the initiation of the project in December 1988 the project team has developed specific terms of reference and has contacted oil industry, other regulatory jurisdictions and private tank owner/operators in order to define the scope of the project.

Deepwell Injection: Deepwell injection applications for underground storage of gas, industrial waste disposal and return of produced water are referred to Alberta Environment by the Energy Resources Conservation Board (ERCB) for ministerial approval. The referral procedure ensures that deepwell injection schemes are carried out in an environmentally safe manner.

Hydrogeological Cross-Sections: As part of the continuing "Base of Ground Water Protection" mapping project, hyrogeological cross-sections traversing Alberta are being prepared. Some 45 hydrogeological cross-sections have been completed and another 21 are in final preparation. Cross-sections covering most settled areas of the province have been constructed, and continued mapping will address the remaining settled regions and areas of oil industry activity.

The ERCB revised the guidelines for casing and cementing requirements. In areas of limited mapping or where a discrepancy between previous and present guidelines exists, the inquiry is referred to the Ground Water Protection Branch from the ERCB.

Landfill Investigations: Hydrogeological investigations at prospective regional and modified landfills were continued as a service to local authorities. Investigations are conducted to ensure that landfills are located in areas where the risk of ground water contamination is low. In the landfill site selection process, hydrogeologic constraint maps, office evaluations, and site specific hydrogeologic testing are employed. Reports containing results of hydrogeologic investigations were prepared for 15 prospective regional and 15 modified landfill sites in the province. In addition to these, 73 proposed landfill sites and 13 industrial landfill applications were reviewed.

Permanent ground water monitoring systems have been established at 19 regional and three modified landfills. Monitoring activities typically consist of recording water levels and collecting ground water samples for chemical analysis. Monitoring results for each regional landfill are reported annually.

Industrial Plant Monitoring: Branch personnel provided technical assistance to regulatory authorities in the evaluation of ground water monitoring proposals and data from industrial plants. In the past year, ground water monitoring proposals and/or monitoring data were reviewed for approximately 50 industrial plants (predominantly sour gas plant facilities).

High Quality Water Sampling: A province-wide ground water quality monitoring project began in 1985. The project will determine natural ground water quality of specific aquifers, using strict sampling protocol.

A total of 62 wells were sampled in this year, including nine that had been sampled the previous year. Duplicate sampling is required to ensure the results represent true natural ground water quality.

The water analysis consists of 18 routine parameters, 14 trace/heavy metals, total organic carbon and chemical oxygen demand. Nine parameters are measured in the field using a mobile laboratory.

Subdivisions: A total of 41 subdivision referrals were received for comments on the adequacy of ground water supplies and the suitablility of soils for septic system operation.

Sewage Lagoons: Comments were made on 22 proposals for siting and construction of municipal sewage lagoons.

Hydrocarbons: Some 57 gasoline related incidents were dealt with during the year. These included investigations, reports, clean-up supervisions, sampling and testing, inventory audits, court testimony, policy meetings with fire departments, and tank removals.

Ground water Contamination: Some 30 ground water contamination related events were handled during the year. These included major ground water studies at the Strathcona County reclaimed landfill and the Wetaskiwin reclaimed landfill. Also included were dugout, water quality, seepage complaints, hog lagoon operations, ground water ranking list, effects of burning pesticide containers, landfilling with woodchips, manure dumping, iron treatment, well blow outs and industrial reviews.

Waste Assistance Branch

The Waste Assistance Branch was created by the re-organization of EPS in 1988. The branch assumed responsibility for the Waste Management Assistance Program and the Beverage Container Recovery Program.

Waste Management Assistance Program: This program, established in 1976, provides capital funds and technical assistance to regionalize municipal waste management services.

There are 22 Regional Waste Management Systems operating in Alberta. The systems use 123 solid waste transfer stations, 18 regional sanitary landfills and one private sanitary landfill for the collection and disposal of municipal solid wastes. These facilities have replaced approximately 180 old dump sites. Two regional sanitary landfills are licensed as Class II Industrial Landfills and are able to accept solid hazardous wastes not prohibited from landfill disposal.

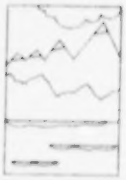
Three new regional systems started operations in 1988-89 and two systems received additional equipment. Three other systems were at various stages in their construction. The program provided $2 million to 10 Regional Waste Management Authorities, including a grant for the development of an association for the province's regional authorities.

Feasibility studies were conducted for five regions in the 1988-89 fiscal year.

Beverage Container Recovery Program: Alberta's beverage container recovery system has been in operation for 17 years. It provides an alternative to landfilling as a method of beverage container disposal. Most containers returned through the system are recycled.

There were 208 beverage container depots operating in the province (41 urban and 167 rural depots). While the number of depots remained constant, several old depots have closed and new ones have opened. Some 58 depot applications were reviewed and approvals to operate were issued for 39 depots.

Significant changes were made to the Beverage Container Act and Regulation in January 1989. The definition of a beverage was revised to include soft drinks, fruit drinks, bottled waters, juices, liquor, non-alcoholic beer and wine and prepared teas. The revised Act also required beverage manufacturers and distributors to register the products they sell with Alberta Environment. This information is given to beverage container depots so they know what beverage containers they must accept.



POLLUTION CONTROL DIVISION

The Environmental Law Enforcement Review Panel was established in 1987 by then Environment Minister Ken Kowalski to review Alberta's approach to achieving compliance with environmental statutes, and to make recommendations to strengthen the enforcement of such statutes. The implementation of these recommendations led to a major restructuring of the Pollution Control Division during the 1988-89 fiscal year.

The new Pollution Control Division was largely formed from the five branches which initially comprised the division, the Air Quality Control, Water Quality Control, Municipal Engineering, Pesticide Chemicals, and Waste Management Branches. The division's two branches are Investigation and Compliance. The investigative, and emergency response functions are carried out by the Investigations Branch. The Compliance Branch reviews non-compliance issues or investigation reports and evaluates and prepares appropriate enforcement actions as provided by legislation.

The Pollution Control Division's mission is "To achieve the protection, enhancement and wise use of the environment by providing firm but fair enforcement of environmental legislation in a timely and consistent manner."

The Investigations Branch seeks to respond to public complaints, environmental quality concerns and environmental emergencies; conduct investigations of pollution sources through source identification, evidence gathering and evidence quality assurance; and evaluate pollution incidents or environmental quality concerns and carry out further steps in support of enforcement action.

The Compliance Branch acts to bring about and ensure compliance with environmental legislation, licences and permits through education, prevention and punitive actions; evaluate the enforceability of permits and licences issued by Environmental Protection Service; assure legislative authority to issue orders and to verify enforceability of the conditions of the orders; and conduct an ongoing review of existing legislation to ensure that the division has the capability to achieve its mission statement.

During the 1988-89 fiscal year, the Investigations Branch responded to a wide variety of environmental emergencies throughout the province, the most notable of which were the spills of sodium dichromate on Highway 831 north of Lamont (the incident occurred March 31, 1988 and carried over extensively into the 1989-90 fiscal year), and the major diesel spill at the Alyth rail yard in Calgary.

During this period, the investigation of routine complaints was carried out in accordance with the mandate of the new division, and investigative issues were resolved outright or reviewed for further enforcement actions.

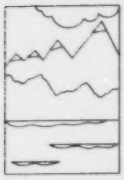
The Investigations Branch received and recorded industry notification of possible licence contraventions, conducted investigations and forwarded the results to the Compliance Branch for a recommendation of the appropriate enforcement action.

Quality Assurance programs which include source monitoring and calibration of industrial ambient air monitoring equipment were undertaken as part of an ongoing industrial data quality control program.

The Compliance Branch, upon reviewing cases put forward by the Investigations Branch for enforcement action, served environmental control orders on five corporate entities to effect compliance with environmental statutes. In addition, two stop orders which require the subject company to cease all activities until the terms of the stop order are fully complied with, were signed by the Minister.

The accumulation of statistics for this period was difficult as much of the data remained with the branches from which much of the division's investigative/ response workforce was drawn. As the Pollution Control Division was formed in December, 1988, it is difficult to provide a meaningful "yardstick" measurement for establishing progress during this formative period.

WATER RESOURCES MANAGEMENT SERVICES



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Assistant Deputy Minister

R. K. Deeprose
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A. R. Strome
Director
Water Resources
Administration Division

B. MacLock
Director
Planning Division

Water Resources Management Services is responsible for the overall management of water resources within the province and for water resource matters held in common with other provinces and the federal government. These responsibilities are carried out by the services' four divisions, Technical Services, Development and Operations, Water Resources Administration, and Planning.

Water Resources Management Services represents the province in interprovincial and federal/provincial water management matters and implements water agreements with the government of Canada. The Assistant Deputy Minister represents Alberta on the Prairie Provinces Water Board and on the Mackenzie River Basin Committee. The Assistant Deputy Minister also represents Alberta Environment on the Alberta Water Resources Commission and the Montana - Alberta Border Advisory Committee. During 1988-89, he served as member of the Oldman River Dam Review Board.

Alberta Water Resources Commission

The Water Resources Commission was involved in the development of proposed water management policies, including guidelines for irrigation expansion, for the South Saskatchewan River Basin. The commission held a number of open houses to discuss water supply limits to irrigation expansion in September 1988. The commission continued work on a report on wetlands management policies with assistance from an interdepartmental steering committee. Research funds were used to support work dealing with on-farm water management, development of water management plans for watersheds in northern Alberta, instream flow needs determination, The Special Areas Water Supply Study, the Western Irrigation District Strategic Management Study, and the Atlas of Alberta Lakes.

Prairie Provinces Water Board (PPWB)

The PPWB comprises representatives from the federal government and the provincial governments of Alberta, Saskatchewan and Manitoba.

Established in 1948, it administers the 1969 Master Agreement on Apportionment of eastward flowing rivers and makes recommendations on water resources matters that concern more than one jurisdiction. During the year, the following principal activities affecting Alberta were carried out:

Appointment Administration: The board approved the Proposed Hydrometric Monitoring Program and Meterological Stations Lists for 1989-90. The terms of the Master Agreement on Apportionment were met over the 1988 apportionment period, with the exception of a minor deficit on Middle and Lodge Creeks due to low flow conditions. It was agreed that while it is important to meet the flow requirements it is also important to manage the water resources of this water scarce area with discretion and in the spirit of cooperation. It was also agreed to make efforts to improve interim reporting information.

Committee on Hydrology: The committee reviewed interprovincial drainage projects licensed since 1984 and noted that the effect of these projects on flow at the interprovincial boundary is minimal. Pre-1984 drainage project information will be gathered for future study purposes. The committee reviewed and approved two natural flow study reports; a natural flow study proposal for the Pipestone Creek basin was accepted.

Committee on Ground Water: The committee discussed the status of the water resources database (WATDOC) with respect to the bibliography of ground water reports in the prairie provinces. Saskatchewan ground water reports are now all listed and work is continuing on listing Alberta and Manitoba reports. The committee reviewed a proposal to develop two production wells in the Bronson Lake Valley Aquifer and agreed with the installation of a monitoring well near the Alberta-Saskatchewan border.

Committee on Water Quality: The 1989-90 PPWB Water Quality Monitoring Program was approved. Some joint water quality monitoring studies will also be conducted by member agencies. The committee reviewed several draft versions of the Water Quality Indicator Supporting Documents. The final reports will be completed when comments have been received on all 11 documents. The committee continued its work in reviewing various quality conditions on interprovincial streams and any short-term excursions to the Proposed Water Quality Indicators.

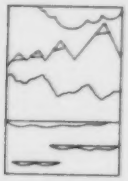
Committee on Water Quality Policy: The committee reviewed many existing documents dealing with transboundary water quality matters including agreements, federal and provincial water quality legislation and policy statements. It also reviewed various approaches used to develop water quality objectives.

The committee will report to the board with recommendations on the board's role in the area of water quality and how that role can be achieved.

Mackenze River Basin Committee (MRBC)

The Mackenzie River Basin Committee was established by the governments of Canada, British Columbia, Alberta and Saskatchewan. Representatives from the Northwest and Yukon Territories are also represented on the Committee. The MRBC is responsible for the exchange of information on water and related resource activities and developments in the basin and for advising on implementation of recommendations from the 1981 Mackenzie River Basin Study Report.

The jurisdictions in the basin have supported the recommendation to develop transboundary water management agreements. In 1988-89, Alberta continued discussions with the Northwest Territories and British Columbia, supported by progress in work at the technical level. Discussions with Saskatchewan also continued.



TECHNICAL SERVICES DIVISION

The Technical Services Division provides the department with expertise in river flow forecasting, river engineering, surface water hydrology and surveying. It coordinates the department's operations in the physical assessment of the occurence, control and effect of surface water in relation to natural phenomena, man-made works and proposed projects.

Survey Branch

The Survey Branch provides land and water surveys to the department. Data collected are used for the investigation, implementation and management of departmental projects, for the management of the province's water resources and to contribute to the data base of land survey and hydrometeorological information. The branch carries out its responsibilities through the Land Survey Section and the Water Survey Section. The branch also operates the Technical Services Division records centre which provides land survey and hydrometeorological data and related information to users throughout the department, to consultants and to the general public.

Land Survey

Engineering and control surveys were performed and arrangements were made for legal surveys, aerial photography and mapping services for the department. There were 459 projects and the cost of contracted services was $748,295.

Water Survey

Hydrometeorological data were gathered by the section's field staff and through two federal-provincial cost-sharing agreements.

During 1988, the following data collection stations were operated by section staff:

- Lake Level 242 stations
- Recording Streamflow or Water Level 70 stations
- Non-recording Streamflow 115 stations
- Snow Courses 18 stations
- Snow Pillows 12 stations
- Recording Precipitation 57 stations

Under the terms of the Federal-Provincial Cost-Sharing Agreement for Meteorological Programs and Stations, 25 stations were operated at a cost of $13,000. Under the terms of the Federal-Provincial Cost-Sharing Agreement for Water Quantity Surveys, 473 stations were operated and Alberta's share of the costs in 1988-89 was $856,000.

Expansion of the real-time hydrometeorological network by the installation of two additional satellite data collection platforms and two landline systems in the southern part of the province brought the total in the network to 104 stations. Data gathering activities continued in the Peace Athabasca Delta with particular emphasis on monitoring the river cutoff from the Embarras River to Mamawi Lake.

Hydrology Branch

The Hydrology Branch provides hydrological engineering analyses of the province's surface water resources. This responsibility includes the determination of annual and seasonal volumes of streamflow, the magnitude of extreme events such as floods and droughts, provision of hydrometeorological information and analyses for water management projects such as river basin planning, reservoir design and lake stabilization. The branch also assesses both the natural and human-altered environmental characteristics affecting streamflow.

During the year, 324 requests for service were handled by the branch. This represents a 23 percent increase over the previous year as shown in Figure 10.

Some of the major studies completed by the branch in 1988-89 were the following: the Peace River Water Resources Management Model was developed to assess water management alternatives; the Water Management Study of the South Heart Reservoir Diversion System assessed water management scenarios; the Oldman River Basin Weekly Water Balance Study 1967 to 1986 examined pre and post regulated weekly flows in the Oldman River below the Three Rivers Dam and the allocation and distribution of water in the system. The results will be used to assess the impact of regulation on fish habitat and instream vegetation. Results from the Highwood River Basin Historical Weekly Natural Flows 1912 to 1988 Study are to be used in the evaluation of management alternatives for the Highwood River and Little Bow River systems and as baseline data in the evaluation of system fisheries habitat. Natural flow studies were completed for the Rosebud River for 1958 to 1986 and for Sounding Creek for 1970 to 1986. These studies produced a set of natural flows at different locations within the basins. The data sets are suitable for assessing water demand versus water supply.

An assessment of the current water licensing situation in the Vermilion River, Sounding Creek, Nose Creek, Mitchell Creek and Fish Creek basins was completed. Hydrology reports and maps for approximately 360 water licences in these basins present the expected volume of water available for future use at each licence location.

River Engineering Branch

The River Engineering Branch provides expertise in the area of river engineering. General areas handled by this branch include the following: river erosion protection and changes in river bed and bank of a river; flooding analysis and preparation of flood risk maps for land bordering on rivers and lakes; hydraulic analysis for flood reduction schemes; ice jam monitoring and control at freeze-up and break-up; evaluation of the impact of water management works (dams, weirs, etc.) on the existing regime of the rivers; input to permits for gravel mining, pipeline crossings, bridges, culverts, intake and outlet work; and river data collection (flood and erosion surveys).

During the reporting period, 28 bridge/culvert crossings, 35 sand and gravel, 247 pipeline crossings, and 50 other assessments for permits and licences were reviewed.

Erosion Protection and River Training

Problem evaluation and preliminary design reports related to river erosion, sedimentation and stabilization were prepared for 27 projects. Major projects were the following: Prairie Creek, Clearwater River, Freeman River, Vixen Creek erosion projects; Pigeon Lake shoreline ice thrust damage study; Milk River, Waterton River Erosion Level 1 reports; Red Deer River channel improvement; Bearberry Creek erosion; Swan River dikes; Lac Des Arcs dust problem; and Fort MacLeod Level II designs.

Flood Risk Analyses

Flood risk maps are prepared to show flood-prone areas so that future land development can take these areas into account to reduce loss of human life and property. Major reports completed were: Oldman Dam downstream flood damage mapping, M.D. of Sturgeon floodplain delineation, Whitecourt floodplain study extension, and preliminary work began on plans for a Canada/Alberta flood damage reduction program.

Flood Control Studies

Studies on alternatives for flood control were conducted for the following major projects: Sawridge Creek 1988 flooding evaluation; Flat Lake outlet control; Lake Wabamun outlet control and channelization; Hutch Lake stabilization; and Swan River flooding.

There were 133 subdivision applications assessed for flood risk as an input to planning commission evaluations.

Ice Jam Monitoring and Control

Break-up and freeze-up ice fronts were monitored at Peace River and Fort McMurray. Extensive work was done with the Alberta/British Columbia Hydro Joint Task Force for the Peace River to set the freeze-up level of the Peace River at Peace River.

Ice monitoring was also carried out on the North Saskatchewan River at Rocky Mountain House and on the Red Deer River downstream of the Dickson Dam.

Hydrogeology Branch

The Hydrogeology Branch provides technical support to the department and other government agencies in hydrogeological, geological and geophysical matters. Its mandate is to identify, protect, enhance and conserve ground water resources through major programs that include the administration of the Ground Water Development Act, management of the Ground Water Resources Information Centre, hydrogeological and geophysical monitoring, the inventory of ground water resources, and liaison with the water well drilling industry and ground water users.

Inspection Section

The Inspection Section administers and enforces the Ground Water Development Act and Regulations. Five inspectors conducted annual on-site inspections on all 230 licensed drilling contractors to ensure their operations were in accordance with the legislation. The inspectors also offered technical expertise to contractors and conducted 85 investigations of well complaints.

Ground Water Information Centre: The Ground Water Information Centre (GWIC), the province's main data bank for ground water information, expanded its data file by more than seven percent during the 1988-89 fiscal year. Complete microfiche sets can be purchased by the public and other private agencies. Microfiche of coal geophysical logs and chemical analysis reports from Alberta Agriculture were entered. The service had a 31 percent increase in enquiries over the previous year and an 89 percent increase in the number of water well drillers' reports.

Provincial Observation Well Monitoring Network: This network obtains water level measurements in over 200 wells and is designed to intercept specific water-producing aquifers.

Ground water monitoring at the Dickson and Oldman River dam sites continued in order to determine the long term impact of these reservoirs on the ground water regimes in adjacent areas. As part of the Oldman River Dam project, several replacement wells were completed for relocated farmsteads.

Geophysical Monitoring:

a) Oldman River Dam area seismicity monitoring: The seismic array detects any reservoir induced seismicity. A small number of local seismic events were detected. Some may have been due to non-dam related blasting in the area; others are very small local earth tremors of tectonic origin, currently under investigation.

b) Turtle Mountain Study: The multi-phased rock stability monitoring program continues monitoring for early warning of possible rock slides. A major component is the seismic monitoring, which is fully integrated with the Oldman River seismic system. A small number of tiny local events (apparently related to mine collapse) continue to be detected, as well as recordings of local blasting activity (related to oil and gas exploration, limestone quarrying and coal mining in British Columbia).

Ground water Evaluation: Interaction with the ERCB on ground water related investigations has increased. More than two dozen investigations have been carried out for the purpose of protecting ground water resources.

Active membership continued on the Interdepartmental Exploration Review Committee, and Development and Reclamation Review Committee. Ground water modelling activities focussed on pumping test analyses and relief well management. Computer programs to determine aquifer properties based on data obtained during pumping tests were adapted to the mainframe computer.

River Forecast Centre

The River Forecast Centre monitors river streamflow conditions and provides flood forecasts for disaster prevention and flood damage reduction. It also produces water supply forecasts to enable management of the province's water resources.

Streamflow Monitoring and Forecasting

The centre continuously monitored weather, snowpack, and streamflow conditions throughout the province. Impending flood situations were detected and analyzed. When necessary, the centre disseminated warnings of expected high river levels to a variety of agencies responsible for flood damage prevention and flood event analysis.

Several high water and flood events occurred during the months of June and July. The most significant of these was the July 5-8 precipitation which caused major flooding throughout the Lesser Slave Lake region. Several new historical recorded maximum flows were established in this area.

Other flood events worthy of note were: June 6-9 in the Grande Prairie area; June 12 in the area northwest of Ft. McMurray; June 14 in Grande Prairie; July 2-5 on the Sousa, Keg and Wabasca Rivers; and July 15-19 in the Wabasca, Red Earth and Jackpine Creek areas.

The centre monitored streamflow conditions at Alberta's borders and advised the department's water managers on impending difficulties. This ensures the province satisfies its responsibilities in interprovincial and international agreements.

Weekly river reports on current streamflow conditions and expected trends for many of the most important streams in Alberta were produced and disseminated. The centre continued its public information service for canoeists and other recreational interests through an automatic telephone answering machine.

Water Supply Forecasting: The centre produced and distributed the Spring Runoff Outlook report in cooperation with the Survey Branch. This report was issued in early February, March and April 1988.

The spring snowmelt runoff of 1988 was much-below-normal to almost non-existent throughout most of southern and central Alberta.

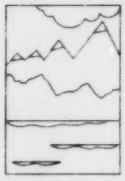
The centre also produced and distributed the Water Supply Outlook for Southern and Central Alberta report in cooperation with the Survey Branch on a monthly basis from March to August of 1988.

Water supply conditions in the North and South Saskatchewan River basin during the summer of 1988 were much-below-normal except for the Bow River which was only considered below-normal. The low runoff coupled with above-normal demand for water resulted in 42 percent of the natural flow of the South Saskatchewan River being used. This is the highest percentage use of water on record. The combination of high use and low runoff depleted the carry over storage amounts in the Waterton-St. Mary-Ridge-Chin reservoir system to the lowest on record.

As of February 1989, the Spring Runoff Outlook and the Water Supply and Snow Survey Bulletin were combined into one report. Information on ground water conditions reported by the Hydrogeology Branch was added.

Climatic Network and Data Acquisition

The centre used data from Alberta Environment's real-time hydrometeorological network extensively. The centre continued its planning for the gradual expansion of this network into other areas where the present data base is inadequate to support satisfactory river monitoring and forecasting services.



DEVELOPMENT AND OPERATIONS DIVISION

The Development and Operations Division provides services that range from the investigation and design through to the operation and maintenance of water resources projects which support sustainable development in the province. Engineering services are provided by the Design, Geotechnical and Construction Branches. Operation and maintenance of water resource projects are carried out by the Projects Management and Irrigation Headworks Branches. Administrative support, supply and maintenance of equipment and operation of the revolving fund are the responsibility of the Equipment, Supplies and Services Branch. Management of the Irrigation Headworks Rehabilitation Program is provided through the director's office.

Design Branch

The Design Branch performs feasibility, preliminary and detailed hydraulic and structural engineering designs and drafting for the development, rehabilitation and maintenance of various water management projects. These designs are prepared for the rehabilitation of existing irrigation headworks systems and for water resource projects such as lake stabilization, flood control, erosion control, and drainage. The branch coordinates design for projects which are mainly hydraulic and structural in nature and provides project management services on larger, generally more complex projects.

The branch carries out technical reviews of engineering designs performed by others. The branch also provides engineering design for water resource projects as requested by other departments.

Diversified drafting services, including photographic services, are provided to the department by the drafting pool. For the 1988-89 period, the branch performed 15 preliminary project designs, 17 detailed project designs and 21 project reviews.

Some of the projects which were designed include the following:

United Irrigation District Rehabilitation: This program involves upgrading 15 kilometres of existing canal and associated structures. The total estimated cost of this main canal upgrading program is approximately $9.3 million. The Design Branch prepared the final design and contract documents for the replacement of the Cochrane Lake outlet structure and the predesign for Reach I of the main canal (approximately six kilometres).

Carseland/Bow River Headworks System: The Design Branch prepared contract documents for a concrete syphon, four metres in diameter and 436 metres long, which will convey irrigation water across West Arrowwood Creek. The project is estimated to cost $3.7 million and is scheduled for completion in 1990.

Hutch Lake Dam: This multi use project, approximately 30 kilometres northwest of High Level, involves construction of a dam, associated structures, and reservoir clearing phased over a three year period, which began in 1987. For the 1988 construction period, three public tenders were prepared and awarded. Construction cost for this second phase was $1.5 million. The total estimated construction cost for the project when completed will be $3.5 million.

Special Areas Water Supply Project: The Design Branch, jointly with P.F.R.A., initiated a conceptual engineering study for a proposed water conveyance system to deliver water from the Red Deer River to the upper reaches of Berry and Sounding Creeks. The water delivery system requires a pumpstation on the Red Deer River near Nevis. The system layout consists of a three kilometre pipeline, 112 kilometres of main conveyance canal and associated structures, and channel improvements to the upper reaches of the receiving streams. The water delivery system will provide water for irrigation, domestic and stockwatering purposes.

Tall Cree I.R. #173A Project: A conceptual design consisting of several alternatives to control flooding on the reserve located along Highway 88, 50 kilometres southeast of Fort Vermilion was prepared. The design involved three channelization schemes and one diking scheme for protection against flooding. The estimated cost for this flood control project ranged from $.7 to 1 million.

Drafting Pool: The Drafting Pool was reorganized in June and a permanent drafting position was established in the Peace River regional office. The drafting pool continues to provide diversified drafting services to the division and to the department.

The Structural Drafting Unit prepared preliminary and detailed drawings for various water resources related projects, such as dams, spillways, syphons, check and grade control structures.

The Survey Drafting Unit prepared survey drawings for water resources development projects, maps for dam breach inundation studies, mosaics, various plates for reports, and displays for meetings.

The General Drafting and Mapping Unit was involved in two major projects, the production of the "Atlas of Alberta" and preparation of major displays and art graphics for the Alberta Environmental Centre. General drafting service was provided to most divisions within the department including the Red Deer and Peace River offices.

Geotechnical Branch

The Geotechnical Branch provides geotechnical investigations, soil laboratory and construction quality control testing, preliminary and final geotechnical engineering designs, project management and land administrative services for departmental water management projects.

Geotechnical Design Section

The section is responsible for all of the geotechnical design requirements for departmental water management projects. This includes establishing conceptual designs, planning geotechnical investigations, evaluating soil parameters, completing detailed geotechnical design considerations, preparing cost estimates and final contract document preparation.

During the past year, the section completed 12 preliminary and 14 final geotechnical designs for a variety of projects such as the rehabilitation of existing irrigation headworks systems, flood protection and recreation dams, flood protection diking, erosion control structures, boat launches and slope stabilization.

The section also provides a specialized geotechnical engineering review service for the department including dam safety evaluations for dams owned by the department, river bank stability evaluations, subdivision development proposals, pipeline river crossings, mine tailing disposal sites, etc. During the past year, the section carried out 39 of these reviews.

Geotechnical Investigations Section

The section performs detailed geotechnical investigations, specialized in situ testing, monitors instrumentation installations and granular and rock riprap material resource reconnaissance for departmental water management projects. This includes provision of drilling equipment and labour required to drill boreholes, field classify and sample soils and, where required, specialized in situ permeability and strength testing as well as monitoring equipment installation.

During the past year, a total of 22 projects were investigated for the Geotechnical Branch and 24 sites were investigated for other divisions within the department.

Laboratory Services Section

The section provides soil laboratory and construction quality control testing for departmental water management projects. This includes detailed classification and physical strength laboratory testing of soils as well as evaluation of the suitability, degree of compaction and gradation characteristics of soils used in the project construction. The section also performs concrete quality control testing.

During the past year, the section conducted laboratory testing for 22 projects and construction quality control for six projects.

Land Services Section

The section administers the inventory of departmental owned and controlled lands. This includes negotiating land use agreements for engineering studies and granting easements, leases, and permits to agencies requesting access or use of departmental land. The section also coordinates all departmental land related referrals, the transfer of land titles to the department and the posting of reservations on Crown land on behalf of the department.

The section also provides land related services to other divisions within the department including appraisals to establish land value, negotiating land damage claims, initiating land purchase agreements, etc.

Construction Branch

The branch manages construction, and administers construction contracts for water management projects. In 1988-89 the branch worked on 42 projects involving expenditures of approximately $9 million. These projects were funded from the Surface Water Development and Control Program, Alberta Water Management and Erosion Control Program and the Irrigation Headworks and Main Irrigation Systems Improvement Program.

The branch also carries out public tendering procedures for the acquisition of construction services and the agreement execution process for consulting, construction and utility service agreements for the Design, Geotechnical and Construction Branches. In 1988-89, 13 public tenders were carried out and 58 service agreements were processed.

Branch staff were involved as project managers for the Eastern Irrigation District and Western Irrigation District Main Canal projects funded from the Irrigation Headworks and Main Irrigation Systems Improvement Program, and for the Parlby Creek-Spotted Lake, Whitford-Rush Lakes, and Waskatenau Creek projects funded under the Surface Water Development and Control Program.

The following are examples of projects constructed in 1988-89:

Whitford-Rush Lakes Water Management project, located three kilometres southeast of Andrew involves outlet channel improvements along Egg Creek to provide flood protection and

the construction of control structures on the lakes in order to manage the water levels to enhance wildlife habitat. The project is to be constructed over several years. Expenditures for construction in 1988-89 were $257,000.

Western Irrigation District Main Canal Rehabilitation project, located in Calgary and extending to Chestemere Lake involves the rehabilitation and expansion of 25 kilometres of irrigation main canal and associated structures. This project is scheduled to be completed by 1995. Work in 1988-89 involved mainly preparatory work such as utility and bridge modifications. Expenditures for construction were $605,000.

Podruzny Flood Control Rehabilitation project, located four kilometres east of Wanham, involves improvement and construction of grade control structures along an existing and badly eroded flood control channel. The work was carried out to prevent further erosion to the channel at a cost of $212,000.

Projects Management Branch

The branch operates and maintains provincially owned and cost shared multi-purpose water management projects. Some 60 water control structures are operated to provide flood control, water conservation, streamflow regulation, lake stabilization, recreation, wildlife and waterfowl habitat, and assured water supplies for many towns and villages. Another 180 water management projects are maintained to provide flood, erosion and drainage control.

The central sector repaired eroded channels and dikes on the Clearwater River and operated various water control structures including Thunder Lake, Gull Lake, Pigeon Lake, Bigelow reservoir and Morecambe structure. Emergency Water Supply inspections were carried out for the villages of Legal, Thorhild, Radway, Grassland, Elk Point and Neerlandia (County of Barrhead).

Projects in the southern sector include: domestic, municipal, irrigation, stockwatering, recreation, fisheries and other uses. General inspections and maintenance were carried out on 27 projects. Water diverted or released to assist users with their water requirements totalled 77 million cubic metres.

The Town of Slave Lake experienced the largest flood ever recorded when up to 160 millimetres of rain fell in the upper Sawridge Creek basin over an 18 hour period July 6, 1988. As well as causing considerable erosion and debris blockages, this rainfall resulted in flow overtopping the dikes along the Sawridge Creek through the town. The entire crews of the Peace River and Grande Prairie sectors were involved with the clean-up and repairs of the dikes and floodway channels.

The 1988-89 season was the sixth year of operation and maintenance of the Dickson Dam. Inflows throughout the summer were close to the mean average, therefore the reservoir was operated at normal levels throughout the year. The reservoir was kept at the elevation of 946.0, one month longer than in previous years, to enhance recreational use of the reservoir and prolong flood control capability.

Two lake stabilization projects operated by the branch were Gull Lake, located 12 kilometres west of Lacombe and Lac Ste. Cyr, located 19 kilometres southeast of St. Paul. Both lakes are used extensively for recreation. The declining water level of Gull Lake resulted in pumping from the Blindman River between April and October in order to raise the lake towards its target elevation. Some 1.2 million cubic metres of water were pumped into Lac Ste. Cyr from October 1988 to February 1989 during which time the lake level increased by 0.56 metres.

The Emergency Water Supply Program was established to assist communities throughout Alberta that experience short term municipal water supply problems. The following communities were assisted with emergency pumping: Spirit River, Fairview, Thorhild, Radway, Legal, Wanham, Rycroft, Tangent, Spedden and Woking.

The Deadfish/Sheerness Water Supply System is located south of Hanna and north of the Red Deer River in Special Area No. 2. The Deadfish/Sheerness system is a pumped diversion scheme on the Red Deer River, consisting of pipelines, concrete canals and natural stream beds for conveyance of water to irrigation, domestic and municipal users. During 1988 the systems provided water for 2,985 hectares of irrigation in addition to supplying water for the Henry Kroeger Regional Water Services Commission, Cessford, Sunnynook and many stockwater dams and dugouts.

Approximately 16.2 million cubic metres of water was diverted by this system from the Red Deer River. During 1988 Alberta Power Limited was required to blowdown approximately 5.5 million cubic metres of water from the Sheerness power generating station.

Under the Site Development Program, designated areas at reservoirs and stabilized lakes that are being used as access points for water based recreation, are developed to accommodate day use activities. During 1988-89, upgrading and development were carried out at Figure Eight Lake, Coal Lake, McGregor reservoir, Waterton reservoir, St. Mary's reservoir and Gleniffer Lake/Dickson Dam. Under this program, 33 day use sites have been established for the general public's use on 21 stabilized lakes and reservoirs throughout Alberta.

Equipment, Supplies & Services Branch

The Equipment, Supplies & Services Branch provides support to Water Resources Management Services and the department.

Administrative Support Section

The section is responsible for the overall budget, financial management, personnel administration and records management for the division. It also provides contract administration for use of works, site maintenance and revenue agreements.

Revolving Fund Accounts Section

The accounts section monitors and processes payments to vendors, invoices users for items sold or rented, monitors revenue and expenses, reports to management on financial status and prepares and monitors the revolving fund budget.

Materials Section

The section maintains a supply of materials, hardware, small tools, and equipment for use in construction, maintenance, drilling and survey activities on water management projects undertaken by the department. With warehouse and yard storage facilities in Edmonton, Lethbridge, Grande Prairie and Peace River, the section manages a bulk material stock inventory of approximately $.25 million and, provides support through the provision of purchasing, warehousing, transport, distribution and equipment leasing services.

Equipment Section

A variety of both large and small equipment consisting of approximately 600 units is administered by the Equipment Section to support Water Resources Management Services. Repair, welding, and carpentry services are provided in Edmonton and Lethbridge.

The section assisted in the construction of a drainage ditch at Fort Macleod and reconstructed driving banks at Calgary; installed safety and trash booms at Calgary and Carseland weirs; overseen the set up of laboratory facilities for Geotechnical Branch in Arrowwood; and assisted Alberta Agriculture with the Emergency Pumping Program.

Central Vehicle Services

The vehicle co-ordinator for Alberta Environment administers the vehicle pool for the department throughout the province. Approximately 350 vehicles were issued this year on a permanent, seasonal and short term basis.

Irrigation Headworks Branch

The branch manages, operates and maintains irrigation headworks systems which supply water for multi-purpose uses including water for the following eight irrigation districts in southern Alberta:

St. Mary River (SMRID), Lethbridge Northern (LNID), Bow River (BRID), Western (WID), Mountain View, Leavitt and Aetna (MVID, LID, AID) and Magrath (MID). During water shortages the United Irrigation District (UID) may receive some of its water from the Waterton/St. Mary headworks system. Two other irrigation districts, Raymond (RID) and Taber (TID) are supplied by water originating from the Waterton/St. Mary headworks system from the SMRID main canal. Some 358,000 hectares (884,000 acres) of assessed irrigation land benefited from water diverted by the following five provincially owned irrigation headworks systems: Waterton/St. Mary, Carseland/ Bow, Western, Lethbridge Northern and Mountain View, Leavitt and Aetna.

The province is not responsible for operation and maintenance of the headworks systems of the Eastern (EID), United (UID) and Ross Creek (RCID) irrigation districts. Under agreements between the province and the UID and RCID, funding was provided for urgently needed rehabilitation to keep the headworks systems operational.

Work on the LNID headworks system included several surface drainage improvements complete with drain inlet structures. The drainage improvement work included a system of dikes, drainage ditches, backfilling and reclaiming adjoining farmland and providing proper riprap protection at the drain inlets. Slope stability problems at the inlet channel upstream of Keho Lake were repaired and extensive snow fencing was installed at the east end of the lake to reduce wind erosion at low lake levels. Other structural improvements included electrical grounding, expansion joint repairs on Oldman flume, painting of Willow Creek flume envelope and painting of steel bridge caps. The syphon delivery for Rocky Coulee Water Users' Association was replaced. The main canal rehabilitation was completed in 1988.

Maintenance and rehabilitation work on the Waterton/St. Mary system included the following: replacement of an old timber canal bridge; resloping and gravel armouring of the main canal banks; replacement of the double barrel wood stave syphon across Pinepound Coulee; and installation of additional piezometers by Dam Safety Branch at Waterton dam to monitor the core. A heavy duty permanent snow fence was erected to prevent snow build up in a concrete drain inlet structure at East Ridge. An all time record low reservoir level at St. Mary permitted the first inspection of the upstream portion of the irrigation tunnel since the early 1950s and repairs to the concrete tunnel liner. The St. Mary irrigation tunnel control building was upgraded and new lighting was installed in the tunnel to improve safety and visibility. The underground irrigation system in the park below St. Mary dam was expanded.

On the Western headworks system, continued emphasis was placed on making the public aware of the dangers at the weir on

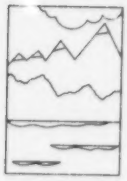
the Bow River in Calgary. Rehabilitation on this system included the replacement of two bridges, relocation of eight utility crossings and tree cleaning for the first five kilometres of the system.

The BRID installed six new turnouts to replace the existing pump intakes. Repairs to two drop structures were carried out, a bridge was replaced, an existing tile drain and cutoff curtain was extended and Queenstown check bypass drain was modified. Day use areas at Milo, Travers and Little Bow reservoir were maintained. Concrete repair work was carried out at Lake McGregor North dam upstream slope.

Major works carried out at the Mountain View, Leavitt, Aetna headworks system included reseeding of borrow areas, replacement of two timber bridges with CSP crossings, chemical weed spraying, and maintenance of public use areas.

The branch has its headquarters in Lethbridge. Staff are also located in Calgary, Oldman River dam, St. Mary dam, Fort Macleod and Arrowwood.

Table 11 shows the apportionment of water delivered by the headworks system to the irrigation districts in 1988.



WATER RESOURCES ADMINISTRATION DIVISION

The Water Resources Administration Division is comprised of the office of the Director, four branches and five regional offices. Under the authority of the Water Resources Act, the Water Resources Regulations, Provincial Water Power Regulations, the Dam and Canal Safety Regulation and the Drainage Districts Act, the division administers and enforces water resources legislation, regulations, policies and programs such as the Alberta Water Management and Erosion Control Program which provides financial assistance to local authorities. Services are extended to the general public, local authorities, industry, other government departments and divisions within the department.

Water Rights

The Surface and Ground Water Rights Branches process applications under the Water Resources Act for licences to divert and use surface water and ground water. Terms and conditions for licences are prepared through liaison with other agencies and input from private individuals or groups. Files and plans are maintained for all projects and the quantity of water consumed is monitored by field inspections and mailed water-use returns.

Surface Water Rights Branch

The total number of new applications decreased slightly from the previous year and the number of active projects in the province increased (See Tables 12 & 13).

A moratorium on issuance of further irrigation project licences for the Oldman River Basin was implemented July 1, 1988. Moratoria on further processing of licence applications in the Willow Creek, Highwood River, Little Bow River and Milk River Basins were retained throughout 1988-89, except for small domestic, stockwatering and necessary municipal purposes.

Due to licensing concerns, a study of the Antelope Lake sub-basin was carried out and preliminary results show that the basin is fully allocated.

Staff continued to provide input to water management studies for the Pekisko-Stimson Creeks, Kneehills Creek and the North Saskatchewan River basins through the technical advisory committee.

Water use information was collected for the Lodge, Battle and Middle Creek basins and was sent to Water Survey of Canada,(WSC) Regina in accordance with interprovincial and international commitments for these basins. Water use information was also collected for the Many Island Lake basin and provided to the Prairie Provinces Water Board (PPWB). This basin is managed jointly by Alberta and Saskatchewan and the PPWB was able to update their records for all projects in the Many Island Lake basin.

Considerable staff time was spent in various stages of the approvals required for the Oldman River Dam.

Hydro-Electric Section

The Hydro-Electric Section administers the Provincial Water Power Regulations under the Water Resources Act.

Field inspections were conducted to monitor progress at hydro-power maintenance projects to ensure compliance with licences and regulations and to observe various sites in relation to disposition applications. Modifications to improve the probable maximum flood (PMF) capabilities at the Ghost Diversion Developments continued.

Public interest in the development of small hydro-electric facilities at various sites within the province, particularly the Dickson Dam, continues. Submissions were received for the development of small power sites at the Belly River Chute, Waterton and St. Mary Dams.

Net hydro-electric generation in the province for the past five years was:

Year	Megawatt-Hours
1984	1,420,000
1985	1,385,366
1986	1,821,670
1987	1,459,252
1988	1,447,629

Ground Water Rights Branch

The Ground Water Rights Branch experienced a sharp increase in the number of licence applications during the latter half of the 1988-89 fiscal year (see tables 14 and 15). The increase was due to the large number of water wells drilled under the Alberta Water Supplies Assistance Program (AWSAP).

Most of the applications received by the branch were for approval to divert and use ground water for agricultural purposes.

A total of 186 field inspections were carried out during the 1988-89 year. This is an increase of approximately 40 percent and is attributed to concerted effects to visit many of the sites where new wells were completed under the AWSAP. The majority of inspections (169) were carried out to obtain data for licensing purposes; 11 were carried out under section 33 of the Water Resources Act; and six were complaint investigations.

Regional Services Branch

The Regional Services Branch administers and enforces the Water Resources Act. The branch provides financial assistance to local governments and municipalities, technical assistance for farm water management projects and inspects water-related problems.

The five branch offices are located in Peace River, Edmonton, Red Deer, Calgary, and Lethbridge. These regional offices are responsible for authorizing nonconsumptive uses of water as required by the Water Resources Act and for undertaking Water Rights Branch inspections to assist in consumptive water use authorizations. In addition, letters of authority authorizing temporary withdrawals of water, are issued. Regional offices are also responsible for investigating violations of the Water Resources Act and for commencing court actions where appropriate.

Financial assistance is provided to local governments and municipalities under the Alberta Water Management and Erosion Control Program. The Alberta Government contributes 75 percent of engineering and construction costs, except in the case of water management projects which improve agricultural land or agricultural production. For the latter, 86 percent of construction and engineering costs are provided. Projects eligible for assistance include flood and erosion control, water management, flow regulation, water-based recreation, wildlife enhancement, sources of water supply and water management overview studies.

In 1988-89 the department provided $4,587,000 in grants to local governments under the Alberta Water Management and Erosion Control Program.

Under the Farm Water Management Program, the regional offices provide technical assistance to landowners who wish to construct a water management project. This assistance includes survey and design services required to construct the project.

The Regional Services Branch is also involved in the administration of the Alberta Water Supplies Assistance Program.

The program, announced by the Honourable Don Getty, Premier of Alberta, on April 21, 1988, was established to assist rural landholders and communities experiencing water shortages as a result of prolonged dry conditions throughout the province. This followed several years of below average precipitation and resulted in seriously depleted surface and ground water supplies for rural landholders and communities.

This program is jointly administered by Alberta Environment, Alberta Agriculture, Alberta Transportation and Utilities and Alberta Forestry, Lands and Wildlife.

Alberta Environment provides financial assistance to individual landholders for drilling water wells, and to communities for developing temporary replacement water supplies.

The major objectives of the program are to mitigate the immediate impact of the drought on rural water supplies and provide long term benefits to farm producers by helping secure more reliable, drought resistant water supplies for the future. Alberta Environment carries out this responsibility by providing a well drilling grant to rural landholders (including acreages), to encourage them to develop deeper, more drought resistant wells.

During the 1988-89 year, 6113 individual landholders received well drilling grants, and 35 communities were assisted in providing temporary replacement water supplies. The breakdown of grants paid for individual and community projects, in each region, is shown on Table (16).

The announced duration of the program was two years. Alberta Environment will consider applications for wells drilled up to March 31, 1990.

Table 17 summarizes regional activities for the year.

Peace River Region

The 1988 spring runoff occurred late compared to the last several years. In late June, 200 mm of rain fell in the Nampa area.This was followed by extensive rain storms in the Swan Hills and Rainbow Lake areas which caused flooding along Sousa Creek , the Swan and Driftpile Rivers, Martin Creek, Willow River and Sawridge Creek. Extensive flood damage occurred to the town of Slave Lake as a result of overtopping of the flood control dikes. Alberta Public Safety Services initiated a flood recovery program for the Slave Lake and Kinuso areas. In late fall, the Keg River, Ft. Vermilion/LaCrete areas received approximately one metre of snow.

A total of 249 inspection requests were received. There were 240 inspections conducted and 210 technical reports processed. The Farm Water Management Program accounted for 42 of the inspections received and Water Rights for 51.

The region issued 21 interim licences for nonconsumptive water use projects, 184 permits and 68 letters of authority for temporary water withdrawals and processed 249 applications for grants under the Alberta Water Supplies Assistance Program.

Some 13 projects were started or constructed under the Alberta Water Management and Erosion Control Program.

Edmonton Region

Most of the Edmonton Region area received 80 percent of normal precipitation for the period November 1, 1988 to March 31, 1989. This was considerably higher than the previous year.

There were 282 requests for field inspections of water control and water management problems, 90 requests were related to alleged violations under the Water Resources Act. During this fiscal year, 279 field inspections were completed. As of March 31, 1989, 84 requests were outstanding and required an inspection. In addition, 98 inspections were completed on projects for which a licence or permit was issued.

A total of 83 licence applications and 308 permit applications were received. Some 68 interim licences, 48 licences, 250 letters of authority and 288 permits were issued. As of March 31, 1989 there were 38 outstanding licence applications and 34 outstanding permit applications that required processing.

During the 1988-89 fiscal year 26 projects were funded with local authorities under the Alberta Water Management and Erosion Control Program and six projects were funded totally by the province.

There were 30 new requests under the Farm Water Management Program, 28 surveys and 12 designs were completed during the fiscal year. Construction was undertaken on four projects. A total of four interim licences and 11 licences were granted for projects under this program. In addition, 20 Farm Development and Reclamation Project referrals and 10 Soil Conservation Project (Alberta Agriculture) referrals were reviewed.

The region approved 2857 applications for grants under the Alberta Water Supplies Assistance Program. As of March 31, 1989 there were 150 applications that were outstanding.

The Edmonton Region prepared one court brief for an enforcement case related to a violation under the Water Resources Act. One case involved prosecution under the Act and four cases were referred to the Water Resources Enforcement Committee.

Red Deer Region

Program activity in the Red Deer Region remained high during the 1988-89 fiscal year particularly in the area of the Alberta Water Management and Erosion Control Program and the Alberta Water Supplies Assistance Program.

Water supply conditions throughout the Red Deer Region varied from near average in the western or foothills region to extremely dry in the eastern or prairie regions. Although winter snowfall was near average, runoff was still below average in most areas except in the Red Deer area. The eastern areas received little or no runoff.

The region received 190 inspection requests, with 83 outstanding from the previous year. A total of 247 inspections were carried out, leaving a total of 26 outstanding.

The region received 125 permit applications, 14 licensing applications and 129 requests for temporary authorization for water withdrawal.

Regional staff issued 122 permits, 10 interim licences and 129 letters of authority. The region also issued four final licences under the Water Resources Act.

A total of 18 new requests were inspected under the Farm Surface Water Management Program and the inventory of projects under consideration totalled 59.

All of these projects were either in the survey, drafting or design stage. Construction was undertaken on five projects.

A total of 10 projects were constructed under the Alberta Water Management and Erosion Control Program. One project was totally funded by the province. More than 25 new potential projects were investigated and inspected for eligibility under the program.

Under the Alberta Water Supplies Assistance Program the region approved 1253 grant applications. A total of 28 projects were inspected, and 670 telephone and office enquiries were received of which 40 percent were office visits.

The Red Deer Region prepared one court brief for an enforcement case related to a violation under the Water Resources Act. One prosection under the Act was undertaken.

Calgary Region

Much needed precipitation was received at the end of March in the form of snowstorms. However, windy, warm weather in early April dissipated snowfall accumulations and as a result, little runoff was generated. Below normal runoff values were experienced in the western portion of the region and generally no runoff was recorded in the special areas. This dry weather trend continued until the beginning of June.

Favourable precipitation conditions were experienced across much of the Calgary region during the summer of 1988. Normal precipitation accumulation values were recorded with the weather station in the badlands area, recording twice the long term precipitation average for the month of June. Weather conditions were generally consistent across the region with normal July rainfall amounts and above normal accumulations in August and the first half of September.

A total of 113 inspections were completed for consumptive water use projects, nonconsumptive water use projects, enforcement under the Water Resources Act and complaints related to surface water.

It was a successful year for the Alberta Water Supplies Assistance Program. A total of 916 applications were received of which 902 were approved for funding.

The Calgary Region issued 116 permits and eight licences for nonconsumptive water use projects under Section 11 of the Water Resources Act.

Three projects were constructed and 10 were under review under the Alberta Water Management and Erosion Control Program.

Lethbridge Region

In the southern portion of the province the 1988 crop yields were light due to the worst drought conditions in recent decades. The irrigated farm areas approached the winter with the dim outlook of probable water shortages in the spring due to extensive depletion of all major reservoirs in the supply system.

However, average winter snowfall and timely spring rains combined to brighten expectations considerably for 1989.

The Lethbridge Region received 160 requests for field inspections, the total of inspections undertaken was 113. There was a carry over of 99.

There were 13 farm water management requests received and 12 reports were prepared. Staff responded to 24 referrals from Alberta Agriculture.

During this fiscal year the region received 53 applications for permits and 11 for nonconsumptive water use licences. Some 57 permits and seven licences were issued over this period. A total of 42 letters of authority were issued.

Under the Alberta Water Management and Erosion Control Program five projects were constructed. There were 10 project proposals under investigation or at various stages of the approval process.

There were 854 applications processed under the Alberta Water Supplies Assistance Program and 823 grant payments were made to individual farmers.

Six enforcement issues were brought forward for either ministerial orders or court action.

Dam Safety Branch

The Dam Safety Branch reviews designs for dams referred by the Controller of Water Resources and monitors the safety of existing dams. The branch operates under the authority of the Dam and Canal Safety Regulation which applies to dams that are at least eight metres high or have a reservoir capacity of at least 62,000 cubic meters. In 1988-89, 1324 dams met these criteria.

During 1988-89, the Dam Safety Branch reviewed designs submitted for 87 water rights licence applications. Dam safety reports on the Waterton Dam, Poplar Creek Dam at Syncrude and on Suncor and Syncrude Tailings Ponds were reviewed. An external consultant began preparation of a dam safety report on the Dickson Dam.

A major part of the branch's work is inspections and instrumentation. In 1988-89, 110 dams were inspected at locations ranging from the Cypress Hills to Fort McMurray. Instrumentation was installed at the Taylor's Coulee Chute and Waterton dams. Instrumentation was read at several projects including the Dickson and Paddle River dams and the major Irrigation Headworks dams. Slope indicators were read adjacent to the Carseland Weir, the Western Irrigation District Weir and Taylor's Coulee Chute. Instrumentation proposals for the Oldman River Dam were reviewed. Work continued on computer programs for reducing and plotting instrumentation data.

Detailed computer analyses were done on the effect of hypothetical breaches in the Waterton Dam and the St. Mary River Dam as far downstream as Medicine Hat. An Emergency Preparedness Plan on the breach of the St. Mary Dam was completed and distributed to all interested parties for comment. An analysis of the effects of failure of the W.A.C. Bennett and the Peace Canyon Dams on the Peace River in B.C. was carried out downstream of the town of Peace River. A dam breach impact assessment was made of the East Dam at 40 Mile Coulee.

The branch provided a computer display for Environment Week and began preparations for the first Canadian Dam Safety Association seminar.

Administrative Support Branch

This branch is responsible for the overall budget, financial management, personnel administration, purchasing, accounts payable, inventory control, records management control and consultant contract administration for the division. It provides administrative and advisory support to the nine drainage districts in Alberta and coordinates requests for flood analyses and the appraisal of damage claims for Alberta Public Safety Services.

Financial Administration Section

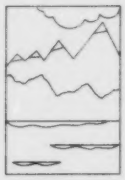
This section prepares the yearly divisional budget, monthly budget forecasts, and is responsible for purchasing, accounts payable, personnel administration, payroll, contract administration, inventory control of fixed assets including EDP hardware and software, attractive items and controlled numbered forms. It also coordinates accommodation, parking, vehicle rental and office automation for the division.

Records Administration Section

This section is responsible for the creation, maintenance, retrieval, control and disposition of records on the management and licensing of the province's water resources. These records are used mainly by the Water Rights Branch and Regional Services Branch in the administration of the Water Resources Act. Drainage district records which are used by Drainage Council in the administration of the Drainage Districts Act are also maintained in this section. Table (18) illustrates the work performed and a comparison of increases/decreases over the previous two years.

Alberta Public Safety Services

The branch head, as a member of the Disaster Assistance Committee, was involved with Alberta Public Safety Services in coordinating the evaluation of 10 storms and flood events. In addition, 50 inspections of flood-related incidents were investigated at the request of Alberta Public Safety Services.



PLANNING DIVISION

River Basin Planning

River basin planning deals with the water resources of a basin as a system. Basin studies cover water supplies and demands, environmental needs, water resource conflicts and other water related factors. A basin plan recommends ways of meeting future needs, resolving allocation and environmental problems and provides guidance for the development of water resource projects. Plans are updated periodically to incorporate changing conditions.

A planning and management strategy for establishing instream flow needs for Alberta streams was set up. The strategy involves an interdepartmental Task Force, River Basin Working Groups and the Alberta Water Resources Commission. Special interest groups, stakeholders and the general public can participate in river basin working groups.

Peace River Basin: A working model simulating the natural flows on the Peace River was developed. Baseline water quality monitoring was initiated on the mainstem of the Peace River. Preliminary work began to identify appropriate water quality models. The majority of staff efforts were in support of the sub-basin water management planning component of the basin planning program.

Athabasca River Basin: Work on the Athabasca Basin planning program progressed in a number of areas. A summarized version of the detailed program was prepared and circulated within the department and a number of revisions incorporated. In light of accelerated pulp mill development, updated forecasts of water use and effluent discharges in the basin were prepared.

A water quality modelling technique was selected for the Athabasca River basin following a workshop attended by departmental staff and several outside experts. A graphics program was also developed to illustrate the modelling results.

Data collected in previous studies on urban flooding, recreation, drainage and wetlands, and ground water components of the planning program were analyzed and entered into a computerized database. Further work was completed on the identification of key recreational waterbodies in the basin and an inventory of wetlands and waterfowl habitat was initiated.

North Saskatchewan River Basin: A comprehensive analysis of current and future water use to the year 2006 was completed. River sampling between Edmonton and the border and monitoring of major city outfalls was done for a selected storm in Edmonton. This data is being used to calibrate Multi, a computer model developed to predict the impact of storm events on water quality in Edmonton. A process for public involvement in the basin planning program was developed and background studies summarized for public distribution.

Cold Lake-Beaver River Basin: Implementation of the Cold Lake-Beaver River Long Term Water Management Plan continued. Planning for the implementation of the North Saskatchewan River water supply pipeline to the Cold Lake area was initiated. This work culminated in the February 1989 announcement by Premier Don Getty of the formation of a ministerial task force to ensure implementation of the pipeline by the 1991 deadline specified in the Long Term Water Management Plan. Review of water recycling guidelines for wastewater from in situ oil sands plants continued with the oil industry and the Energy Resources Conservation Board.

South Saskatchewan River Basin: The Alberta Water Resources Commission made recommendations on water management in the South Saskatchewan River Basin based on information from planning studies and input obtained from public hearings. Water management policy and strategies to guide future planning activities in the basin are being developed by the department based on commission recommendations.

Regional Water Resource Planning

Similar in scope to river basin planning, this section deals with a small geographic area, usually a sub-basin. The following are some of the projects dealt with during the reporting period:

Lac La Biche Lake Level Stabilization, Feasibility Study: A study is being undertaken to assess the feasibility of stabilizing the level of Lac La Biche. This involves the evaluation of a number of stabilization alternatives, their benefits, costs and environmental impacts. As part of this study, the potential environmental impacts of the Sir Winston Churchill Park causeway are being assessed.

Sub-Basin Water Management: The Sub-Basin Water Management Planning Study was initiated in April 1985 to improve the water management planning process in northwestern Alberta, with specific concerns related to agricultural drainage of wetlands and erosion control. Phase 3 pilot studies were initiated for two water management units, to use previously generated baseline data to develop plans with direct public input from the local authorities, landowners and the general public. The objective of the pilot plan phase is to

develop a water management planning methodology applicable to all sub-basins in northwestern Alberta.

Willow Creek Basin: A decision to construct an offstream storage project in the Willow Creek basin was announced by the Minister of Environment in December, 1988. The Pine Coulee project will consist of a 41,000 acre foot storage reservoir located on Pine Coulee adjacent to Willow Creek, a diversion structure on Willow Creek and a 3.5 km canal from the diversion structure to the reservoir. The principal function of Pine Coulee Reservoir will be to store water during high runoff periods for controlled release to meet downstream water needs during periods of low natural flow.

Little Bow River Basin: Water management measures in the Little Bow River basin announced by the Minister of Environment in December, 1988 consisted of the following: diversion structure and canal from Mosquito Creek to Clear Lake; dam and 50,000 acre foot storage reservoir on the Little Bow River downstream of Mosquito Creek; and enlarging the Little Bow diversion canal from 100 cfs to 300 cfs. These measures are intended to promote multi-purpose uses, including recreation, stockwatering, municipal water supply and irrigation in the Little Bow River basin, and improved water quality and fishery habitat in the Highwood River downstream from High River.

McLeod River Basin: Coal mining and forestry development forecasts were assessed for potential runoff impacts on the basin's water resources. Water balance modelling runs were undertaken to incorporate these potential effects. Suspended sediment data were collected and compiled. Work began on a technical report on study methods and on a water balance model users' manual.

Pembina River Basin: A study outline for a floodplain management study was drafted. Phase I of the study involves a preliminary evaluation of the benefits and costs of various structural and non-structural alternatives aimed at reducing future flood damages in the Pembina River Valley. The purpose of Phase I is to select the most viable alternatives for detailed evaluation in Phase II.

Kneehills Creek Basin: The second phase of a water management program assessed the ability of current water supply to meet present and future demands and developed water management alternatives to solve problems. The impact of alternatives was identified and an overall water management plan and strategy for the basin were completed. A final report has been prepared and distributed to technical committee members.

Guy Area: An evaluation of regional agricultural flooding, erosion and drainage problems was initiated with the objective of identifying possible improvements to the existing surface water collection system.

Anderson Creek: This area contains productive wetland habitat and producers in the area are also experiencing flooding problems. A study was initiated to develop solutions that would ensure the integrity of the wetlands and also address agricultural concerns.

Minnie Lake/Village of Glendon Water Supply: This project was completed. The village of Glendon is now using ground water and is no longer withdrawing water from Minnie Lake. Minnie Lake water levels are being monitored.

Project Planning

Project planning deals with water management issues specific to a particular project. The following are some of the projects dealt with during 1988-89:

Milk River Project: Environmental studies addressing the impact of increased irrigation on ground water and the Milk River continued. Investigations related to the impact of a storage reservoir on downstream vegetation were initiated. The exchange of technical information between Alberta and Montana continued.

Drumheller Flood Control: Implementation of flood control measures in Drumheller continued. Various alternatives for flood control in East Coulee have been assessed.

Red Deer River Valley Irrigation: A study has been undertaken to identify and evaluate the potential for expanding irrigation on land within the valley between Drumheller and the Saskatchewan border. A report has been prepared and distributed for review.

Rocky Mountain House Winter Floodplain Monitoring Committee: Due to mild winter conditions, the committee did not report any specific local flooding problems related to flow fluctuation and winter ice packing downstream of the Bighorn power plant on the North Saskatchewan River.

Fort McMurray Floodplain Management Study: The proposed flood protection dike for Fort McMurray is awaiting negotiation of a cost-sharing agreement with the federal government and the city. These negotiations will begin when the Flood Damage Reduction Agreement between Canada and Alberta is signed.

Environmental Mitigation Planning

This step in the planning process is carried out at the project implementation stage. The intention is to identify opportunities for environmental enhancement stemming from the construction of water resource management works and to ensure that adverse environmental effects are properly mitigated during and after construction.

Oldman River Dam Project: Environmental mitigation planning responsibilities were transferred to Public Works, Supply and Services. Work continued on wildlife, fisheries, vegetation, historical resources and recreation components.

Hutch Lake Project: The pike spawning mitigation plan was refined and a feasibility analysis of a subimpoundment continued.

United Irrigation District Headworks/Cochrane Lake: Environmental mitigation studies were continued. Environmental planning input from other departments was coordinated.

Data Base and Methodology Development

The effectiveness of the Planning Division is enhanced by the compilation and updating of water resource data such as water supply and demand. As well, new analytical and predictive methods can improve the capability in water quality planning.

Water Use Information System: This data base provides water withdrawal and consumption statistics for agriculture, municipal, industrial, enhanced oil recovery and water power use sectors. Entry of historical data continued and output from the system was provided to other divisions, consultants, oil companies and other agencies.

Industrial Water Use Survey 1986: This survey is part of ongoing program in which data are collected every five years. A questionnaire was administered to 569 industrial water users in Alberta.The collected data will be used in the preparation of a report on provincial industrial withdrawals, discharges and consumption. Aggregated data will be presented by industrial sector and by river basin.

Other Planning Services

Regional Lake Overview: Work began to develop a process by which a warning system could be established to identify lakes in a region which could receive development pressures so the department can be ready to respond as needed.

Water Resources Act Taskforce: The division participated on this new taskforce which will recommend changes to the Act and develop a plan for implementing those changes.

The division provides a number of other services such as monitoring of water management or related environmental issues, administration of special water management programs, technical support to other government agencies or to community groups and advice and representation on interprovincial water resource matters.

Report Design: Several base maps, display and other visual materials were prepared in conjunction with river basin planning program projects. Planning Division reports were reproduced and assembled. A Water at Work exhibit was revised and was displayed at several locations around the province. The branch coordinated and produced Oldman River Dam project display materials for use at information meetings and public advisory committee workshops.

Municipal Water Demand Studies: Water demand forecasts for several municipalities were prepared for use in basin planning studies or to assist in establishing water licensing requirements.

Regional Water Demand Studies: Water demand studies were completed for tributaries of the Milk River in the Sweetgrass Hills area and for the Sylvan Lake area. As well a survey was sent to oil companies in the Cold Lake - Beaver River Basin and a draft report was written concerning future water demands for in situ oil recovery projects.

Regional Planning

Regional planning concerns regarding water resources were addressed in reviews and final preparation of the Big Lake Area Structure Plan and the County of Strathcona Outdoor Recreation Master Plan. As well, experimental lime treatment to Figure Eight Lake was undertaken.

MacKenzie River Basin Committee

Division staff participated in the collection of background data in support of transboundary water management agreements between Alberta, British Columbia, the Northwest Territories and Saskatchewan. A water quality monitoring program was initiated with the government of the Northwest Territories and Indian and Northern Affairs Canada. This program will collect water quality data on the Hay and Slave Rivers at the border over the next five years.

Negotiations with British Columbia on a transboundary water management agreement for the Peace River were initiated. Negotiating, Technical Advisory and technical subcommittees were established and are now co-ordinating data collection activities on the Peace River. This data form the basis of an agreement between B.C. and Alberta on the management of the Peace River at the border.

STATISTICAL TABLES

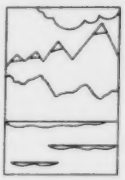


TABLE 1
Development Applications Linear Projects Section

Type of Projects	Number of Projects Approved 1988	1989
Development & Reclamation (D & R) Pipelines	28	50
Non - D & R Pipelines	230	245
Water & Sewer Pipelines	14	15
Electric Transmission Lines	24	33
Industrial EIA Projects	10	11
Total	306	354

TABLE 2
Operational Reclamation Projects 1988-89

Disturbance	Municipal	Public	Green Zone	Total
Garbage Dumps/ Landfills	32	—	6	38
Sewage Lagoons	13	—	—	13
Gravel and Sand Pits	4	3	1	8
Coal Mines	2*	—	—	2
Industrial Sites	3	—	5	8
Water Reservoirs	5	—	—	5
Miscellaneous	—	—	1	1
Total	59	3	13	75

* *Includes Blairmore and Belleuve Coal Piles*

TABLE 3
New Project Referrals to EIA Review Branch
April 1, 1988 - March 31, 1989

Type of Projects	Number of Referrals
Coal Mines	5
Industrial	17
Oil and Gas	28
Oil Sands	18
Water Resources	2
Hydro and Electric	5
Linear	6
Recreation	7
Other	4
Total	92

TABLE 4
Ministerial Consents Summary (April 1, 1988 to March 31, 1989)

RDA	Total Requests	Consent	No Consent Refusal	Required	*P/W/A	Total 1974-89
Calgary	49	35	0	1	13	1300
Capital City Park	3	3	0	0	0	69
Edmonton	37	16	3	2	16	645
Edmonton-Devon	11	6	0	1	4	214
Edmonton-Fort Saskatchewan	15	15	0	0	0	160
Fish Creek	1	0	0	0	1	15
Fort McMurray	5	4	0	0	1	68
Sherwood Park West	2	1	0	0	1	120
Strathcona	0	0	0	0	0	8
Turtle Mountain	2	1	0	0	1	13
Total	125	81	3	4	37	2612

* *Pending/Withdrawn/Administative Closure*

TABLE 5
Subdivision Referral Activities

Planning Authority	No. of Applications 1987-88	1988-89
Regional Planning Commissions		
Battle River	60	54
Calgary	159	324
Edmonton Metropolitan	70	82
Mackenzie	42	62
Oldman River	80	88
Palliser	103	93
South Peace	20	31
Red Deer	192	180
Southeast Alberta	17	27
Yellowhead	124	158
Planning Services Division (Municipal Affairs)	144	183
Cities		
Airdrie	2	5
Camrose	9	0
Leduc	2	1
Lethbridge	4	0
Fort McMurray	2	0
St. Albert	9	9
Fort Saskatchewan	0	2
Counties		
Grande Prairie No. 1	26	38
Parkland No. 31	33	30
Strathcona No. 20	54	28
Municipal Districts		
Rocky View No. 44	226	317
Improvement Districts		
I.D. #5	1	0
Total	1,379	1,712

TABLE 6
Air Quality Permits and Licences 1988-89

Category	Permits	Licences
Meat Packing and Processing Plants	0	6
Asphalt Plants	4	15
Chemical Plants	4	14
Compressor Stations	23	102
Concrete and Cement	1	4
Experimental In-Situ Oil Sand Operations	0	0
Fertilizer Plants	2	4
Gas processing Plants	37	108
Incinerators	7	50
Oil Refinery Operations	3	4
Power Plants	2	4
Pulp Mills	3	3
Tar Sands	8	10
Wood Processing	3	5
Others	16	32
Subtotal	113	361
Amendments	14	107
Total	127	468

TABLE 7
Clean Water Act Approvals Issued 1988-89

Category	Permits	Licences
Asphalt plants	0	13
Chemical plants	6	6
Coal processing	0	3
Concrete and cement	0	0
Fertilizer	2	14
Food processors	0	0
Gas plants	13	76
Meat packing and processing plants	0	11
Oil sands plants	0	0
Petroleum refineries	2	5
Power plants	2	3
Pulp mills	4	3
Salt caverns	0	1
Sand and gravel washing plants	9	23
Snow Disposal Sites	0	3
Tar sands	5	7
Wood processing	0	2
Others	19	28
Subtotal	62	198
Amendments	7	67
Total	69	265

TABLE 8
Municipal Permits and Licences 1988-89

Category	Permits	Licences
Water supply	99	98
Sewage treatment	64	54
Water and sewer extensions	26	–
Storm sewer systems	72	–
Total	261	152

TABLE 9

	Water Treatment	Wastewater Treatment
Number of Exam Session	13	13
New Operating Certificates Issued	42	38
Certificates Upgraded	71	62
Certificates Renewed	468	397
Total Certificates	749	621

TABLE 9A

	No. of Operators	No. of Municipalities Served
Courses/Workshops	200	156
Certification Preparation	56	50
Seminar	250	171
Homestudy Courses	21	6
Correspondence Courses	42	36

TABLE 10
Hydrology Branch
Requests Completed

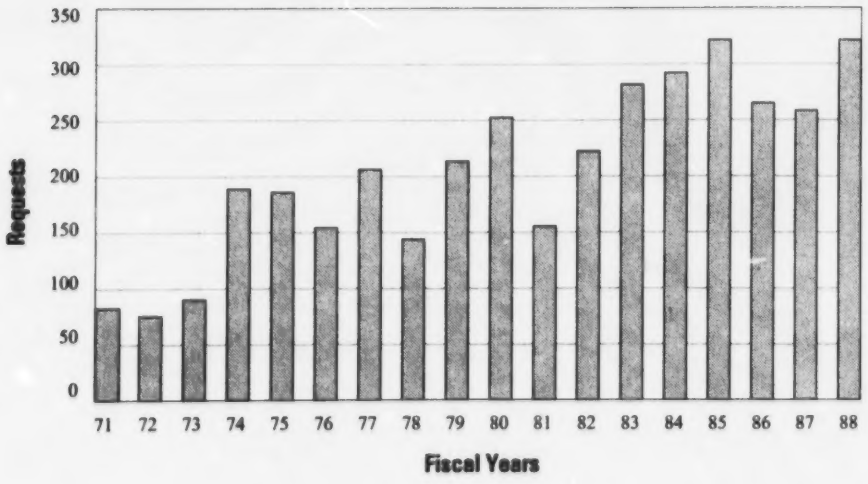


TABLE 11

Irrigation District	Water Dam³	Volume Ac. Ft.
St. Mary River (incl.TID and RID)	805,000	653,000
Bow River	481,000	390,000
Western	213,000	173,000
Lethbridge Northern	275,000	223,000
Mountain View, Leavitt, Aetna	32,000	26,000
Magrath	28,000	23,000
Totals	1,834,000	1,506,000

TABLE 12
Surface Water Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 88-89	Total 87-88
Applications Received	0	14	60	149	19	1	22	56	0	124	445	479
Interim Licences Issued	0	8	75	141	8	0	16	50	0	130	428	389
Interim Licences Re-issued	0	7	98	162	34	0	8	21	0	15	345	452
Licences Issued	0	12	51	109	3	0	12	48	0	95	330	346
Licences Re-issued	0	6	58	144	28	0	6	2	0	4	248	428
Permits Issued	0	265	0	0	361	0	195	0	0	0	821	689
Transfers	0	0	40	65	20	0	1	1	0	1	128	228
Cancellations	0	3	41	24	8	2	4	5	0	31	118	111

Note: Statutory purpose domestic was changed to agricultural on June 8, 1984 for all surface water rights projects.

TABLE 13
Surface Water Rights In Good Standing As Of March 31, 1989

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 88-89	Total 87-88
Applications	0	28	304	51	27	3	40	51	0	133	637	687
Interim Licences	0	32	393	170	24	1	39	95	0	552	1,306	1,265
Licences	0	312	2,165	6,468	337	8	118	660	1	1,055	11,124	10,796
Net Totals	0	372	2,862	6,689	388	12	197	806	1	1,740	13,067	12,748

Note: Statutory purpose domestic was changed to agricultural on June 8, 1984 for all surface water rights projects.

TABLE 14
Ground Water Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Dvrsn.	Storage	Total 88-89	Total 87-88	Total 86-87
Exploration Permits Issued	0	12	0	3	23	5	0	1	44	111	143
Applications Received	10	130	1	352	11	4	5	0	513	246	181
Interim Licences Issued	18	83	0	159	29	14	0	0	303	159	192
Interim Licences Re-issued	0	34	0	12	5	0	0	0	51	69	109
Temporary Permits Issued	0	0	0	0	7	4	0	0	11	61	34
Temporary Permits Re-issued	0	0	0	0	2	0	1	0	2	7	7
Licences Issued	3	74	0	115	2	3	0	0	197	290	316
Licences Re-issued	0	20	0	7	3	0	0	0	30	19	22
Transfers	0	0	0	0	91	0	2	0	93	31	18
Cancellations	0	0	2	2	26	0	1	0	31	86	40

TABLE 15
Ground Water Rights In Good Standing As Of March 31, 1989

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Dvrsn.	Storage	Total 88-89	Total 87-88	Total 86-87
Applications	0	25	0	95	11	0	0	0	131	31	18
Interim Licences	17	64	3	48	39	15	3	2	191	185	340
Licences	107	745	19	865	492	130	18	9	2,385	2,191	1,929
Temporary Permits*	5	2	0	0	305	1	57	0	370	359	325
Net Totals	129	836	22	1,008	847	146	78	11	3,077	2,766	2,612

** Temporary permits were removed from the application stage into a separate category effective March 30, 1987.*

TABLE 16
Summary of Water Supplies Assistance Program Activities 1988-1989

	Peace River	Edmonton	Red Deer	Calgary	Lethbridge	Total
Well Drilling Grants						
No. of Grants Paid	249	2,857	1,253	902	852	6,113
Grant Payments	$ 468,980	$ 3,586,050	$ 1,485,210	$ 977,700	$ 1,378,530	$ 7,896,470
Community Projects						
No. of Projects	6	6	4	3	16	35
Grant Payments	$ 41,060	$ 16,280	$ 54,670	$ 3,190	$ 137,700	$ 252,900
Equipment Rental Costs (Covered by the Department)	$ 52,580	$ 41,700	$ 0	$ 2,030	$ 144,380	$ 240,690

TABLE 17
Summary Regional Services Branch Activities 1988-1989

	Peace River	Edmonton	Red Deer	Calgary	Lethbridge
Inspections					
Requests Received	249	282	273	126	160
Number Conducted	240	279	247	113	113
Water Resources Act					
Licences (Interim) Issued	21	68	10	8	17
Permits Issued	184	288	122	116	57
Letters of Authority	68	250	129	112	42
Water Management Projects					
Alberta Water Management and Erosion Control Program	13	26	10	3	5
Farm Water Management Program					
Requests Received	0	30	18	0	13
Designs Completed	0	12	17	1	12
Enforcement					
Cases Reviewed by Enforcement Comm.	1	4	3	0	4
Court Briefs Prepared for Prosecution	0	1	1	0	2

TABLE 18
Summary of Records Administration Section Activities

Fiscal Year	Files Created	Reports Indexed	Files Retreived	Plans Filmed	35mm Images Produced	16mm Images Produced	Micro-Jackets Produced	Duplicated Film Produced
1987-88	570	546	27,500	5,043	8,321	421,265	21,588	36,322
1988-89	607	286	25,374	4.654	9,541	196,544	5,400	25,483

Records Disposition
1987-88: 63 cubic feet
1988-89: 168 1/2 cubic feet

TABLE 19
Positions by Category

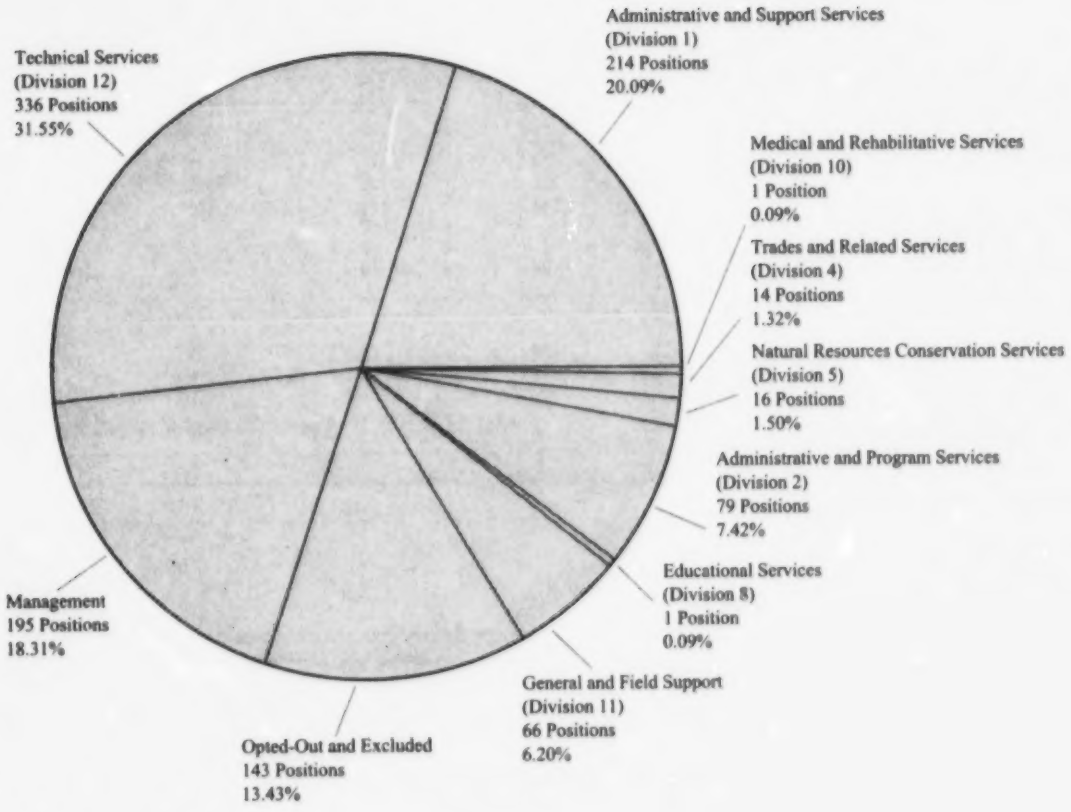


TABLE 20
Employee Locations

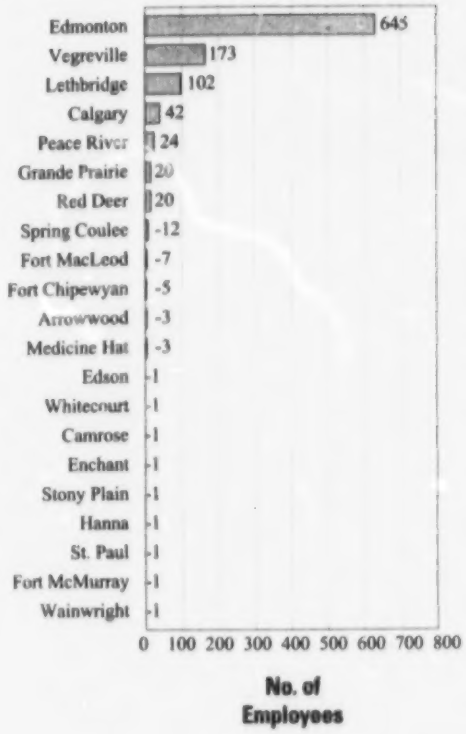
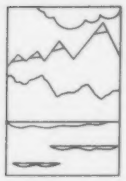


TABLE 21
Employee Distribution

No. of Employees
Office of the Minister 8 0.75
Office of the DM and ADMS/ Special Projects/Human Res. Mgmt. 36 3.38
Standards and Approvals 57 5.35
Planning 47 4.41
Financial Planning 15 1.41
Administrative Support 17 1.6
Systems and Computing 18 1.69
Financial Operations 27 2.54
Water Resources Administration 93 8.73
Development and Operations 212 19.91
Technical Services 129 12.11
Environment Assessment 62 5.82
Land Reclamation 65 6.1
Waste and Chemicals 72 6.76
Pollution Control 39 3.67
Alberta Environmental Centre 168 15.77
0 5 10 15 20 25
Percent

FINANCIAL STATEMENTS



Statement of Expenditures

Statement of Revenues

STATEMENT OF EXPENDITURES
FOR THE YEAR ENDED MARCH 31, 1989

VOTE	GENERAL REVENUE FUND	1988-89	1987-88
1.	**Department Support Services**		
	Minister's Office	$ 312,051	$ 205,886
	Deputy Minister's Office	460,097	684,341
	Finance & Office Services	1,987,264	1,980,711
	Systems & Computing	1,156,594	1,422,662
	Policy Planning & Information Services	1,168,786	1,319,868
	Personnel & Organization Development	608,097	565,722
	Total	$ 5,692,889	$ 6,179,190
2.	**Pollution Prevention and Control**		
	Program Support	262,279	478,624
	Environmental Assessment	4,833,035	3,910,230
	Standards & Aprrovals	3,483,051	2,926,169
	Waste & Chemicals	12,865,743	8,729,340
	Pollution Control	2,335,741	2,014,894
	Total	$ 23,779,849	$ 18,059,257
3.	**Land Conservation**	$ 4,789,096	$ 3,346,326
4.	**Water Resources Management**		
	Program Support	233,081	201,150
	Surface Water Development & Operations	16,552,476	16,550,323
	Water Resources Administration	9,660,949	10,361,092
	Water Resources Planning & Co-ordination	4,233,388	3,984,973
	Data Collection & Inventory	6,525,573	6,383,940
	Groundwater Development	10,356,034	1,624,353
	Total	$ 47,561,501	$ 39,105,831
5.	**Interdisciplinary Environmental Research and Services**		
	Program Support	3,014,369	4,017,576
	Plant Sciences	1,564,557	2,175,828
	Chemistry	2,492,071	2,444,714
	Animal Sciences	2,036,357	2,105,272
	Environmental Technology	1,762,215	1,833,080
	Total	$ 10,869,569	$ 12,576,470
	TOTAL GENERAL REVENUE FUND EXPENDITURES	**$ 92,692,904**	**$ 79,267,074**
	Heritage Savings Trust Fund		
	Farming For the Future	71,603	—
	Irrigation Rehabilitation & Expansion	46,247	—
	Irrigation Headworks Improvement	31,139,618	45,612,366
	Land Reclamation	1,661,734	2,014,387
	Total Heritage Savings Trust Fund Expenditures	$ 32,919,202	47,626,753
	TOTAL EXPENDITURES	**$ 125,612,106**	**$ 126,893,827**

Note: Comparitive Figures
The 1987-88 figures have been restated where necessary to conform to the 1988-89 presentation.

STATEMENT OF REVENUES
FOR THE YEAR ENDED MARCH 31, 1989

SOURCES OF REVENUE	1988-89	1987-88
Payments from the Government of Canada	$ 45,634	$ —
Water Power Rentals	284,761	276,450
Water Diversion Licences	12,465	7,818
Water Well Drilling Permits	22,214	8,433
Industrial Water Diversion	125,989	88,151
Sheerness Deadfish Water Supply	67,509	49,285
North West Alberta Cost Sharing Program	6,911	5,581
McLennan-Girouxville Canal	4,373	4,317
Emergency Water Pumping	1,027	142,296
Property Rental - Alberta Environmental Centre	3,242	4,000
Groundwater Information Service	17,024	7,105
Administration of Crown Land	10,334	5,680
Forfeits - Plans and Specifications	16,169	6,825
Alberta Environmental Centre - Research Contributions	25,800	22,700
Other Expenditure Refunds - Alberta Environmental Centre	19,029	—
Previous Year Refunds	47,618	77,960
Salary Expense Refunds	7,955	—
Recovery of Salary from AUPE	18,385	12,315
Miscellaneous	32,904	22,297
TOTAL REVENUE	**$ 769,343**	**$ 741,213**

WATER RESOURCES REVOLVING FUND FINANCIAL STATEMENTS
MARCH 31, 1989

Auditor's Report

Balance Sheet

Statement of Income and Surplus

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL
AUDITOR'S REPORT

To the Minister of the Environment

I have examined the balance sheet of the Water Resources Revolving Fund as at March 31, 1989 and the statement of income and surplus for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other proceudres as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1989 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon

FCA
Auditor General

Edmonton, Alberta
June 30, 1989

WATER RESOURCES REVOLVING FUND BALANCE SHEET
AS AT MARCH 31, 1989

	1989	1988
Assets		
Current:		
Accounts receivable	$ 486,969	$ 347,957
Materials	251,086	227,465
Prepaid expenses	3,219	3,219
	741,274	578,641
Other: (Note 3)		
Rental equipment	2,633,030	2,742,252
Maintenance and office equipment	27,237	24,441
	$ 3,401,541	$ 3,345,334
Liabilities and Surplus		
Accounts payable	$ 230,603	$ 244,333
Advances from the General Revenue Fund	3,102,154	3,220,418
	3,332,757	3,464,751
Surplus (deficit)	68,784	(119,417)
	$ 3,401,541	$ 3,345,334

The accompanying notes are part of these financial statements.

WATER RESOURCES REVOLVING FUND STATEMENT OF INCOME AND SURPLUS
FOR THE YEAR ENDED MARCH 31, 1989

	1989	1988
Revenue		
Material and gas sales	$ 291,541	$ 164,781
Less: Cost of goods sold	278,348	156,258
Gross profit	13,193	8,523
Equipment rental	2,050,973	1,867,466
	2,064,166	1,875,989
Expenses:		
Operation of equipment	1,058,339	1,170,349
Depreciation	502,882	514,131
Equipment rental	240,043	247,623
Repair and maintenance operations	44,498	45,610
Administration (Note 4)	30,741	31,363
	1,876,503	2,009,076
Income (loss) from operations	187,663	(133,087)
Gain on disposal of equipment	538	76,423
Income (loss) for the year	188,201	(56,664)
Deficit at beginning of year	(119,417)	(62,753)
Surplus (deficit) at end of year	**$ 68,784**	**$ (119,417)**

WATER RESOURCES REVOLVING FUND NOTES TO THE FINANCIAL STATEMENTS
MARCH 31, 1989

Note 1 Authority

The Water Resources Revolving Fund operates under the authority of the Water Resources Act, Chapter W-5, Revised Statutes of Alberta 1980, as amended.

Note 2 Significant Accounting Policies and Reporting Practices

(a) Fixed assets and depreciation

Fixed assets are shown at cost less accumulated depreciation. Depreciation is calculated on a straight-line basis over the estimated useful life of each type of equipment.

(b) Major overhauls

Major overhauls, significantly extending the life of equipment, are depreciated on a straight-line basis over the remaining useful life of the equipment.

(c) Materials inventory

Materials are shown at cost. Cost is determined using the weighted average method.

(d) Leases

All leases with respect to the rental and maintenance of equipment, as lessee or lessor, can be cancelled at the end of any fiscal year and are therefore accounted for as operating leases.

(e) Changes in financial position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Other Assets

Other assets are detailed as follows:

	Cost	Depreciation and Amortization	1989 Net	1988 Net
Rental equipment	$ 6,791,507	$ 4,158,477	$ 2,633,030	$ 2,742,252
Maintenance and office equipment	248,434	221,197	27,237	24,441
	$ 7,039,941	$ 4,379,674	$ 2,660,267	$ 2,766,693

Note 4 Administration Expenses

Salaries, wages, rental charges for the Edmonton, Lethbridge, Grande Prairie and Peace River warehouses and certain overhead costs incurred in the administration of the Fund are borne by the General Revenue Fund and are not reflected in these financial statements.

Note 5 Approval of Financial Statements

These financial statements were approved by management.

SURFACE RECLAMATION FUND FINANCIAL STATEMENT
MARCH 31, 1989

Auditor's Report

Balance Sheet

Notes to the Financial Statement

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL
AUDITOR'S REPORT

To the Members of the Land Conservation
and Reclamation Council

I have examined the balance sheet of the Surface Reclamation Fund as at March 31, 1989. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other proceudres as I considered necessary in the circumstances.

In my opinion, this financial statement presents fairly the financial position of the Fund as at March 31, 1989 in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon

FCA
Auditor General

Edmonton, Alberta
August 21, 1989

SURFACE RECLAMATION FUND BALANCE SHEET
AS AT MARCH 31, 1989

	1989	1988
Assets		
Cash (Note 2)	$ 1,494,546	$ 1,385,629
Securities in trust with the Province of Alberta	344,300	332,925
	$ 1,838,846	$ 1,718,554
Liabilities		
Trust Fund (Note 3)	$ 1,838,846	$ 1,718,554

The accompanying notes are part of this financial statement.

SURFACE RECLAMATION FUND NOTES TO THE FINANCIAL STATEMENT
MARCH 31, 1989

Note 1 Authority

The Surface Reclamation Fund operates under the authority of the Land Surface Conservation and Reclamation Act, Chapter L-3, Revised Statutes of Alberta 1980, as amended. The purpose of the Fund is to hold security deposits received pursuant to the Act as an assurance that satisfactory land surface reclamation will be performed. Since all interest received by the Fund is allocated and subsequently paid to depositors, no surplus or deficit arises on the Fund's operations.

Note 2 Cash

Cash consists of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 3 Trust Fund

Transactions in the Trust Fund are summarized as follows:

	Cash Deposits	Securities	1989 Total	1988 Total
Balance at beginning of year	$ 1,385,629	$ 332,925	$ 1,718,554	$ 1,541,079
Security deposits received	436,121	211,375	647,496	663,790
Interest received	128,202	—	128,202	116,054
	1,949,952	544,300	2,494,252	2,320,923
Security deposits returned	(455,406)	(200,00)	(655,406)	(602,369)
Balance at end of year	$ 1,494,546	$ 344,300	$ 1,838,846	$ 1,718,554

Note 4 Bank Guarantees

In addition to the deposits in trust and securities shown on the balance sheet, the Fund held back guarantees as at March 31, 1989 in the amount of $ 80,257,436 (1988 - $ 80,574,694).

Note 5 Approval of Financial Statement

This financial statement was approved by management.